ONTARIO
DIVISION OF MINES

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SUMMARY OF FIELD WORK, 1972

by the

GEOLOGICAL BRANCH

Compliments of
ONTARIO
MINISTRY OF NORTHERN DEVELOPME T
AND MINES

Not for resale

Edited by

V. G. Milne and D. F. Hewitt

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SUMMARY OF FIELD WORK, 1972

by the

GEOLOGICAL BRANCH

ONTARIO DIVISION OF MINES

INTRODUCTION

by

V.G. Milne[1]

During the summer of 1972 the Geological Branch, Ontario Division of Mines, had 29 geological survey parties, 3 geophysical survey parties, and 2 geochemical survey parties in the field. Some groups worked on more than one project and in all, 37 projects were undertaken, involving the services of 160 people. Six projects were directed by staff of the Industrial Minerals Section, one by staff of the Resident Geologists' Section, three by staff geologists on contract, and the remainder by staff members of the Geological Surveys Section.

The locations of the areas investigated are shown on the map of the Province, Figure 1, page 2. The preliminary results of the work are outlined in this summary, which contains reports prepared by leaders of each of the projects. In these reports, emphasis has been placed on the economic aspects of the different investigations. It is the hope of the Geological Branch that the information thus provided will help in the selection of favourable areas for prospecting and so will be a valuable aid to mineral prospecting in the Province.

Coloured maps and final detailed reports covering most of the field projects are being prepared for publication. In the interim, however, uncoloured preliminary geoscience maps with comprehensive marginal notes, will be released for distribution mostly during the winter of 1972-1973. These will mainly be published at the field scale of 1 inch to 1/4 mile, 1 inch to 1 mile, or 1 inch to 2 miles. Notices of the releases will be mailed to all persons or organizations on the Ontario Division of Mines notification list, and will be published in the technical journals and other media.

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[1]Chief Geologist and Chief, Geological Surveys Section, Geological Branch, Ontario Division of Mines, Parliament Buildings, Toronto.

OUTLINE OF MINERAL RESOURCE SURVEYS, 1972

by

D.F. Hewitt[1]

During the 1972 field season, numerous Mineral Resource Surveys were conducted outlining the production potential of sand, gravel, and quarry stone resources in the respective areas. Mineral resource reports were completed for the following areas in the Province of Ontario:

Anson, Hindon, and Minden Townships, Haliburton County; Bruce Peninsula Planning Area (Albermarle, Eastnor, Lindsay, and St. Edmunds Townships, Bruce County); Cambridge Township, Russell County; Central Northumberland Planning Area (Alnwick, Percy, Haldimand, and Cramahe Townships, Northumberland County); Glengarry Planning Area (Lancaster, Lochiel, and Kenyon Townships, Glengarry County); Ops Township, Victoria County; Portland and Louborough Townships, Frontenac County; Scott Planning Area (Scott Township, Ontario County); Essex County; Wasaga Beach Area (Sunnidale, and parts of Nottawasaga, Vespra, Flos, Medonte, Tiny, and Tay Townships, Simcoe County); Kingston Township, Frontenac County; Verulam Township, Victoria County; Town of Lincoln, Regional Municipality of Niagara; Wainfleet Township, Regional Municipality of Niagara; Mersea Township, Essex County; Townsend Township, Norfolk County; Raleigh and Harwich Townships, Kent County; and Tosorontio Township, Simcoe County.

This work was done by R.A. Brinsmead, D.F. Hewitt, U.J. Vagners, G.J. Burwasser, M.A. Vos, and Q.H.J. Gwyn.

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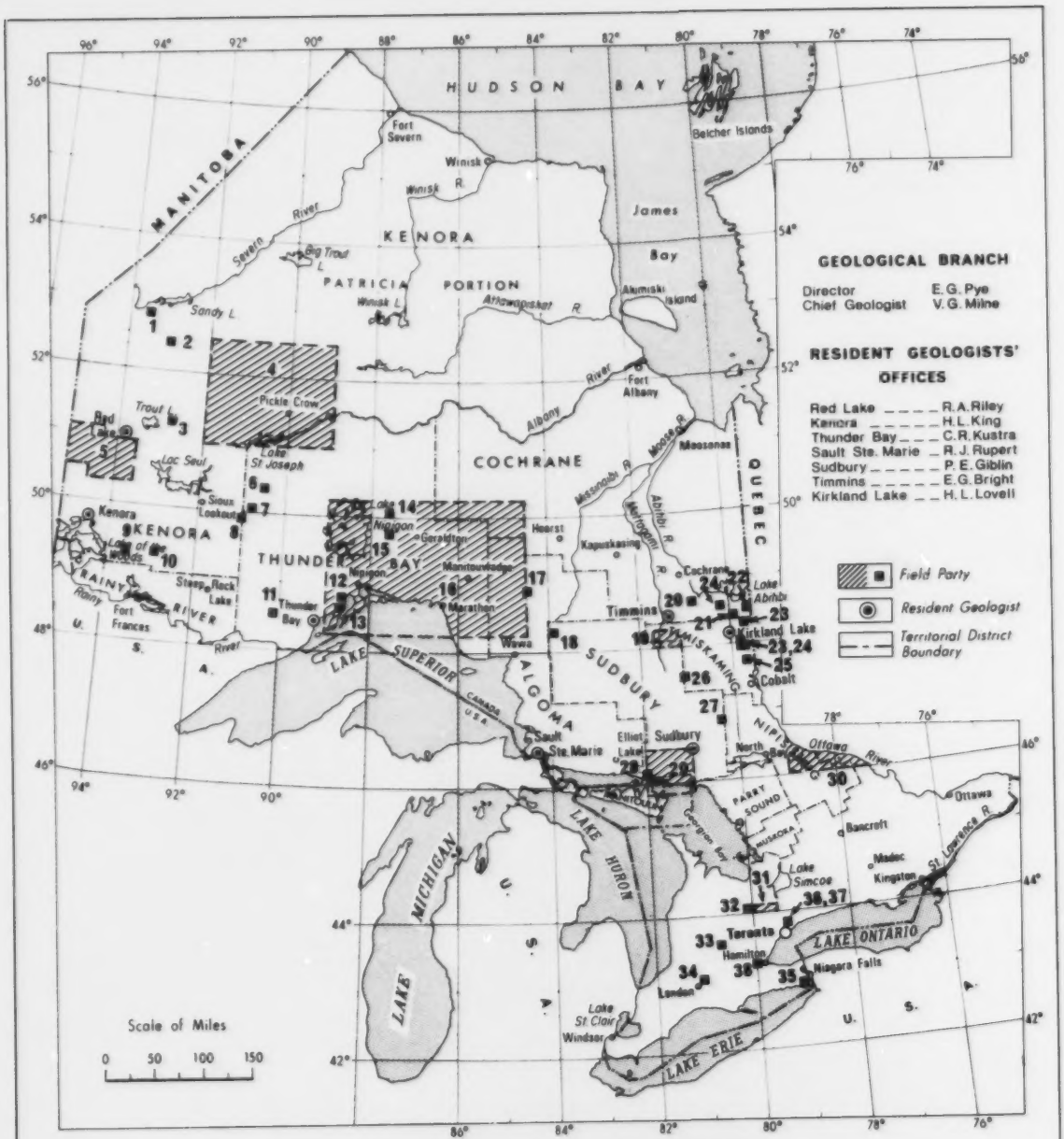


LOCATION OF FIELD PARTIES, 1972

GEOLOGICAL BRANCH
ONTARIO DIVISION OF MINES

ODM 4952

LIST OF FIELD PARTIES, 1972

No.	Location	Leader
1.	Setting Net-Northwind Lakes Area	L.D. Ayres
2.	Hewitt Lake Area (West Half)	J. Wood
3.	Narrow Lake-Shabumeni River Area	A.P. Pryslak
4.	Operation Pickle Lake	R.P. Sage
5.	Bulging Lake-Embryo Lake and Longlegged Lake Areas	F.W. Breaks W.R. Troup
6.	Conant, Jutten, and Smye Townships	W.D. Bond
7.	Squaw Lake-Sturgeon Lake Areas	N.F. Trowell
8.	Bell Lake-Sturgeon Lake, Magnetic Survey	Wooil Moon
9.	Rowan Lake Area	L. Kaye
10.	Lower Manitou-Uphill Lake Area	C.E. Blackburn
11.	Lamport and Duckworth Townships	K.G. Fenwick P. Srivastava
12.	Dorion-Wolf Lake Area	W.H. McIlwaine L.A. Tihor
13.	South Half McTavish Township	W.H. McIlwaine
14.	North Onaman Lake Area	P.C. Thurston
15.	Elmhirst and Rickaby Townships	W.O. Mackasey Henry Wallace
16.	East Quetico Belt Gravity Survey	Wooil Moon
17.	Kabinakagami Lake Area	G.M. Siragusa
18.	Stover and Brackin Townships	G. Bennett
19.	Peterlong Lake Area	D.R. Pyke
20.	Dundonald and Clergue Townships, Magnetic Survey	J.A. McCance
21.	Thackery Township (Magusi River Area)	L.S. Jensen
22.	Staughton and Marriott Townships	L.S. Jensen
23.	Ben Nevis and Skead Townships, Geochemical	W.J. Wolfe
24.	Ultramafic Rocks, Geochemical	W.J. Wolfe
25.	Englehart-Earlton Area	H.L. Lovell
26.	Fawcett and Leonard Townships	M.W. Carter
27.	Afton and Macbeth Townships	H.D. Meyn
28.	Harrow and McKinnon Townships	J.A. Robertson K. Siemiatkowska
29.	Panache Lake Area	K.D. Card D.G. Innes
30.	Mattawa-Deep River Area	S.B. Lumbers
31.	Alliston-Newmarket Area (Quaternary)	Q.H.J. Gwyn
32.	Orangeville-Palmerston Area (Quaternary)	W.R. Cowan
33.	Waterloo-Wellington Counties (Industrial Minerals)	A.G. McClellan C.R. Bryant
34.	Lucan Area (Quaternary)	U.J. Vagners
35.	Welland Area (Quaternary)	B.H. Feenstra
36.	Gravel Inventory, Southern Ontario (Industrial Minerals)	G.J. Burwasser
37.	Industrial Mineral Studies	M.A. Vos
38.	Niagara Escarpment	B.A. Liberty I.J. Bond

No.1 SETTING NET AND NORTHWIND LAKES AREAS

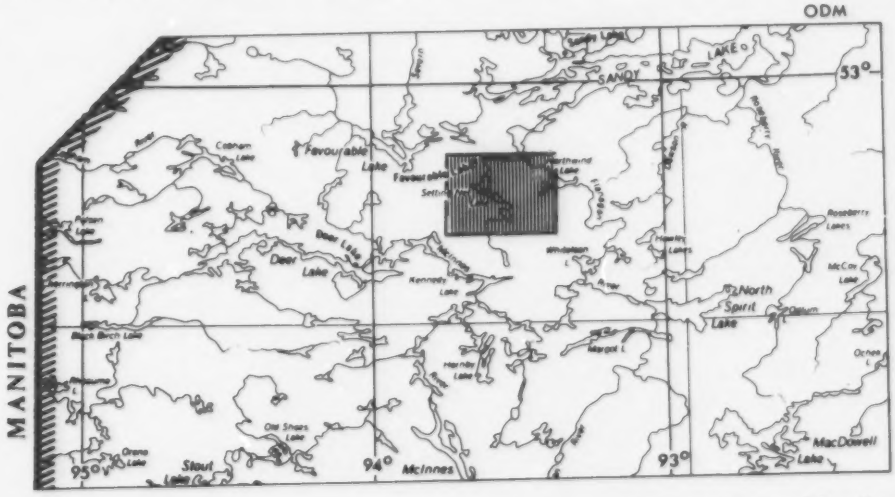
DISTRICT OF KENORA (PATRICIA PORTION)

by

L.D. Ayres[1]

INTRODUCTION: Geological mapping of the Setting Net Lake and Northwind Lake areas was completed in 1969 and 1971 respectively. However, all of the mineral deposits could not be examined in detail during the regular mapping, and in 1972, 5 weeks were spent completing the examination of mineral deposits; many deposits were mapped at a scale of 1 inch to 100 feet and 1 inch to 200 feet.

LOCATION: The map-areas are 120 miles north of Red Lake and cover the southeastern part of the Favourable Lake metavolcanic-metasedimentary belt in northwestern Ontario. Map-area boundaries are Latitudes 52°41' and 52°51'N



LOCATION MAP

Scale: 1 inch to 25 miles

and Longitudes 93°22' and 93°45'W. Access is by float-equipped aircraft from Red Lake.

MINERAL EXPLORATION: Recorded mineral exploration of the Favourable Lake Belt began in 1927, and the belt is now known to contain molybdenum, gold, silver, lead, zinc, copper, iron, asbestos, uranium, thorium, and lithium mineralization. Anomalous features of the belt are (1) high concentration

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of molybdenum, and (2) high silver:gold ratio in many precious metal occurrences. The only mineral production from the belt came from the former Berens River Mine in the Setting Net Lake area. This mine is now held by Zahavy Mines Limited (formerly Golsil Mines Limited) and from 1939 to 1948 it produced 157,341 ounces of gold, 5,676,486 ounces of silver, 6,105,872 pounds of lead, and 1,797,091 pounds of zinc from 560,707 tons of ore; value of production was $9,481,498 (Annual Reports, Berens River Mines Limited).

In September 1972, 430 claims were in good standing in the map-area and claim groups were held by the following individuals and companies: W.C. Arrowsmith, Ecstall Mining Limited, Keevil Mining Group Limited, K. Koleff, S.J. Lesavage, Minorex Limited, Newconex Canadian Exploration Limited, Noranda Mines Limited, North Rock Explorations Limited, Severn Mines Limited, and Zahavy Mines Limited. During the field season, prospecting, geological mapping, and ground geophysical surveys were carried out on properties held by Ecstall Mining Limited and Noranda Mines Limited. In July 1972, diamond drilling was in progress on the property of Severn Mines Limited. Older exploration work is described on published preliminary maps of the area (Ayres 1970; 1972).

GENERAL GEOLOGY: The map-areas cover the southeastern end of a 7-mile wide, southeast-trending, Early Precambrian metavolcanic-metasedimentary belt that extends from Northwind Lake to west of the Ontario-Manitoba border. The belt is widest between Setting Net and Northwind Lakes and gradually narrows northwestward. To the southeast it is terminated, near Northwind Lake, by an intrusive granitic batholith.

The belt is composed largely of a complex metavolcanic sequence that is at least 20,000 feet thick and exhibits a marked cyclicity. Three partial to complete volcanic cycles that, where complete, range in composition from a lower basaltic flow sequence, through an andesitic flow and pyroclastic sequence, to an upper dacitic pyroclastic unit are exposed in the map-area. The base of the section is an intrusive granitic batholith at the southeastern corner of the belt and the preserved part of the lowermost cycle consists of andesitic and dacitic flows and pyroclastic rocks; the lower basaltic section is missing. In general the sequence becomes younger northwestward along the axis of the belt, and the youngest exposed part of the sequence is near South Trout Lake (Ayres, in press). Clastic and chemically precipitated metasediments are locally present in the volcanic sequence.

Minor plutons consisting of sills, dikes, and small stocks of porphyritic trondhjemite, granophyric quartz diorite, felsite, diorite, gabbro, and ultramafic rocks were intruded into the volcanic-sedimentary sequence prior to regional metamorphism and are probably genetically related to the volcanism. Near Setting Net Lake a porphyritic granodiorite-quartz monzonite stock that contains a porphyry molybdenum deposit also appears to predate the regional metamorphism but is younger than the other pre-metamorphism plutons; this stock has an area of 2.5 square miles. Unmetamorphosed, composite, granitic batholiths that range in composition from diorite to

granite intrude and form the margins of the metavolcanic-metasedimentary belt. The batholiths appear to have been emplaced during or slightly after the culmination of the regional metamorphism.

The foregoing summarizes the main geological features of the areas; more detailed descriptions are given in Ayres (1970; 1972; in press).

STRUCTURAL GEOLOGY: The metavolcanic-metasedimentary sequence has been isoclinally folded with fold axes generally trending northwest parallel to the boundaries of the belt. The major folds are upright to slightly overturned and fold axes have relatively gentle plunges. Numerous faults with diverse trends have been recognized and some of these faults greatly hamper stratigraphic correlation. Details of the structural geology are shown on published preliminary maps (Ayres 1970; 1972).

ECONOMIC GEOLOGY: Most of the known mineral deposits in the map-areas have been briefly described on published preliminary maps (Ayres 1970; 1972). The present discussion will be restricted to those deposits for which new data have been obtained by recent field and laboratory work.

(1) Gold-Silver-Galena-Sphalerite-Quartz Veins: The gold, silver, lead, and zinc produced by Berens River Mines Limited from 1939 to 1948 was derived from an east-trending granular quartz vein that occupies a fault-controlled breccia zone in a north-trending felsic metavolcanic unit north of Setting Net Lake. The felsic unit appears to occupy a caldera; it has a strike-length of 3.5 miles, is up to 4,500 feet thick, is composed of a heterogeneous sequence of dacitic tuff, lapilli-tuff, tuff-breccia, and minor flows, and is intruded by two small, synvolcanic, granophyric quartz diorite plutons (Ayres 1970). The mined vein, termed the No. 1 vein, is only one of 16 major veins or vein sets, and numerous minor veins, of similar character and mineralogy that occur in the upper part of the felsic unit over a strike-length of 2 miles. The veins have been metamorphosed and are characterized by: (1) fine-grained granular quartz; (2) erratic distribution of sphalerite and galena, which commonly occur as irregular aggregates or veinlets within the quartz; (3) pinch and swell; and (4) a metamorphosed, actinolite-rich alteration zone in the adjacent felsic metavolcanics. Pyrite is commonly present, but chalcopyrite is rare and is most abundant in some of the northern veins. The veins vary in trend from east in the northern part of the felsic metavolcanic unit to northeast and locally north-northeast in the south-central part, and most, if not all, of the veins occupy steeply dipping fault zones. The veins and faults are subparallel to a well developed regional foliation that shows a similar gradual change in strike and is at a high angle to the trend of the stratigraphic units; the foliation is most strongly developed near veins. The vein-filled faults cut overlying stratigraphic units, but the veins have been found only in the felsic metavolcanic sequence. The veins probably formed during hydrothermal activity associated with cooling of the caldera unit.

All of the veins have been explored by trenching and some diamond drilling, but all of the production and most of the recent exploration work has been confined to veins in the northern part of the felsic caldera unit. Three closely associated veins, Nos. 3, 10, and 19, located 2,500 feet north

of the mined No. 1 vein were explored underground by Berens River Mines Limited in 1947 and 1948 and by Golsil Mines Limited (now Zahavy Mines Limited) from 1966 to 1969. As of February 1968, drill-indicated reserves in these three veins, between surface and 1,000 feet, is 600,000 tons grading 0.18 ounce gold and 7.81 ounces silver per ton, 2.06 percent lead and 2.99 percent zinc; the ore zone is 1,200 feet long (1967 Annual Report, Golsil Mines Limited).

Five veins, numbered from south to north, 9, 16, 15, 14 (+6), and 13, in the south-central part of the caldera unit east of Borthwick Lake have not been as extensively explored and in general have a lower precious metal:base metal ratio than veins in the northern part of the caldera unit. The longest vein, a combination of No. 14 and No. 6 veins, has been traced intermittently for 1,300 feet on claims KRL46824 (Zahavy Mines Limited) and 201778 (Minorex Limited) and is up to 3 feet wide. Grab samples collected by the author from this vein and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained trace to 8.49 percent zinc, trace to 2.80 percent lead, trace to 0.05 ounce gold and trace to 1.61 ounces silver per ton. Similar analytical results were obtained on grab samples collected by the author from the Nos. 13, 16, and 15 veins, and these veins have been traced for strike-lengths of between 30 and 500 feet. The No. 13 vein is exposed on claims KRL46824 (Zahavy Mines Limited) and 201778 (Minorex Limited), No. 15 vein on claims 201778 and 201779 (Minorex Limited), and No. 16 vein on claims KRL46825 (Zahavy Mines Limited) and 201779 (Minorex Limited). The southernmost vein set, No. 9, on claim KRL46825 (Zahavy Mines Limited) has a higher precious metal:base metal ratio comparable to veins in the northern part of the caldera unit. This vein set consists of several north-northeast-trending quartz pods up to 3 feet wide that occur in a 35-foot wide zone. The longest pod was traced for 35 feet before disappearing beneath overburden. Grab samples collected by the author from this vein set and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained trace to 2.72 percent zinc, trace to 4.71 percent lead, trace to 0.24 ounce of gold, and trace to 5.52 ounces silver per ton with one galena-rich sample containing 22.8 percent lead, 2.06 ounces gold, and 12.30 ounces silver per ton.

(2) Gold-Bearing Felsite: A previously undescribed gold showing that is distinctly different from other gold showings in the areas has been located on claims 223153 and 223154 currently held by Newconex Canadian Exploration Limited east of the southern part of Setting Net Lake. Gold occurs in two, closely spaced, north-trending, white-weathering felsite sills within a thin mafic to intermediate tuff and lapilli-tuff unit. The sills are up to 4 feet thick, average 2 feet thick, and have been traced along strike for 840 feet by 9 trenches and several diamond drill holes. Gold occurs both in the felsite and in granular quartz veins or pods that partly replace the felsite. Six grab samples of felsite collected by the author and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained 0.01 to 0.05 ounce gold per ton whereas three grab samples of quartz veins contained trace, 0.10, and 0.26 ounce gold per ton. The most recent work on the showing, including the drilling and trenching, appears to have been done by Kega Mines Limited in 1944 and 1945.

(3) Copper: Many copper showings in the map-areas have been previously described (Ayres 1970; 1972), but two previously undescribed copper showings

were located during the past field season on leased claims held by Zahavy Mines Limited in the Setting Net Lake area. In addition, new data were obtained on two previously described showings in the Northwind Lake area (Ayres 1972).

The first of the previously undescribed showings is a small lens of almost pure chalcopyrite that was found in intermediate lapilli-tuff near the base of the felsic caldera unit. The showing is on the south side of an old road on claim KRL45343, and the host rock unit is only about 10 feet wide, being bordered on the south by a subvolcanic, granophyric quartz diorite pluton and on the north by a thin diabase dike; there is no outcrop on the north side of the diabase. The chalcopyrite lens itself is only 2.5 inches wide, 9 inches high, and of unknown length, but its presence here is intriguing because copper has only rarely been found in the felsic caldera unit. A chalcopyrite-rich sample collected from the lens by the author and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained 14.8 percent copper, 0.10 percent lead, 0.06 percent zinc, 0.24 ounce gold, and 1.38 ounces silver per ton.

The second showing is in a 5-foot thick, north-trending iron formation unit within mafic metavolcanics on claim KRL52192, about 800 feet east of the chalcopyrite lens. The iron formation is composed of magnetite, chert, iron silicate, and carbonate layers with the carbonate layers containing local concordant lenses of chalcopyrite and pyrite up to 5 millimeters thick. A grab sample collected from a carbonate layer by the author and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained 0.38 percent copper.

In 1971, a digenite (chalcocite) occurrence was found by the author (Ayres 1972) in intermediate metavolcanics south of Twinpeaka Lake in the Northwind Lake area. This showing was subsequently staked by Ecstall Mining Limited who trenched the showing in 1972. The trenching revealed the presence of chalcopyrite, pyrite, and specular hematite, in addition to digenite, and preliminary examination of the trenches suggests that the mineralization is zoned; additional trenching has been done since the showing was examined in late June.

The digenite appears to be largely confined to the eastern part of the showing and it forms relatively straight veins up to 1 inch wide that are generally subparallel to a north-trending foliation, although discordant veins are also present. Thin, irregular, diversely oriented, digenite veinlets commonly occur in the altered country rock adjacent to the larger, straight veins. The digenite zone is at least 80 feet long and 10 feet wide.

Immediately west of the digenite zone a 15-foot wide, chalcopyrite-bearing zone was exposed by an east-trending trench that is oriented approximately perpendicular to the digenite zone; the lateral extent of the chalcopyrite is not yet known. The chalcopyrite is commonly associated with quartz and calcite in irregular veinlets that are both concordant and discordant to the foliation in the host rock. The largest vein is up to 10 inches wide, trends easterly along the axis of the trench, and contains about 50 percent chalcopyrite. A grab sample collected by the author from this vein was analyzed by the Mineral Research Branch, Ontario Division of

Mines, and contained 11.1 percent copper, 0.17 percent cobalt, 0.12 percent nickel, and traces of gold, silver, and zinc.

Coarse-grained specular hematite forms irregular veinlets up to 1 inch thick that appear to cross-cut the chalcopyrite veins.

The intermediate metavolcanic host rock is highly altered and in places contains abundant garnet. The general restriction of garnet to this alteration zone suggests that the alteration and associated mineralization formed prior to regional metamorphism.

On leased claims KRL33407 and KRL33410 held by K. Koleff, 0.5 miles east of the south part of Setting Net Lake, a stratigraphically controlled, chalcopyrite-bearing zone has been drilled by Peteque Mines Exploration Limited (627 feet in 1952) and Senet Copper Mines Limited (8,690 feet in 1956-1957). At the showing, narrow, concordant to locally discordant, quartz-chalcopyrite veinlets and minor disseminated chalcopyrite occur in the upper part of a northwest-trending, southwest-facing intermediate tuff-breccia unit that is overlain by felsic tuff; fragments in the breccia are up to 8 feet long. Although the tuff-breccia unit is up to 200 feet thick and has a strike-length of at least 1,300 feet, copper mineralization is confined to a zone 900 feet long with a maximum width of 70 feet, and the limits of the mineralization appear to reflect facies changes in the volcanic sequence. At the southeast end of the mineralized zone, the upper part of the tuff-breccia unit becomes more mafic and finer grained and there is a concomitant decrease in the amount of chalcopyrite present. At the northwest end the decrease in chalcopyrite content is apparently related to three factors: (1) a rapid thinning of the tuff-breccia unit; (2) a rapid decrease in grain size; and (3) a gradual increase in mafic content. The distribution of chalcopyrite mineralization thus appears to be controlled by both the composition and grain size of the host pyroclastic unit.

Overall copper content in the mineralized zone ranges from 0.2 to 0.4 percent, but there are local, higher-grade zones that form discontinuous, concordant lenses up to 5 feet wide; copper content of the higher-grade zones is up to 2 percent (analyses provided by K. Koleff). Grab samples collected by the author from surface showings and analyzed by the Mineral Research Branch, Ontario Division of Mines, also contained trace to 0.2 ounce gold and trace to 1.09 ounces silver per ton.

(4) Molybdenum: The major molybdenum concentration in the map-areas is the Setting Net Lake porphyry molybdenum deposit that occurs in a 2.5 square mile, porphyritic granodiorite-quartz monzonite stock (Ayres 1970; Ayres and Averill 1971). Molybdenite occurs at the northern end of the stock in an east-trending zone up to 1,500 feet wide and 8,000 feet long. The mineralized zone is currently covered by claims held by Minorex Limited and North Rock Explorations Limited and exploration work to date consists of numerous pits and trenches, 8 diamond drill holes, and ground magnetometer surveys; average grade of the drilled sections is about 0.06 percent MoS_2 (Conwest Exploration Company Limited, File 63.2761; Minorex Limited, File 2.904, Assessment Work Files, Ontario Division of Mines).

Associated with the mineralization is an alteration zone consisting of

sericitization and albitization of plagioclase, chloritization of biotite, and introduction of pyrite. Preliminary petrographic examination has shown that this alteration is most intense in the central and western parts of the mineralized zone (L.D. Ayres and S.A. Averill, unpublished data), but all drilling done to date is in the eastern, less altered part of the mineralized zone. The increase in intensity of alteration westward suggests that the grade of mineralization may also increase westward, but this possibility can only be tested by diamond drilling, because the central and western parts of the mineralized zone are poorly exposed.

(5) Lithium: During routine petrographic examination of the granitic batholith south and west of Setting Net Lake, lithium-bearing minerals were found in three samples.

Fine-grained spodumene was found in a white pegmatite dike about 1 mile southwest of the southern part of Setting Net Lake. Such dikes are generally less than 10 feet wide but are relatively common in the granitic batholith in a 0.5 to 1 mile wide, northwest-trending zone adjacent to, but on the north side of, the major fault that extends through Bear Head Lake (Ayres 1970; 1972). No spodumene was observed in these dikes during mapping but the dikes are commonly fine-grained and partly recrystallized. A grab sample of the spodumene-bearing dike was collected by the author and submitted to the Mineral Research Branch, Ontario Division of Mines, for analysis; it contained 0.52 percent lithium.

Holmquistite, the lithium-bearing amphibole, was found in granitic rocks at two localities: (1) 0.5 mile southwest of Pennock Lake, and (2) 0.5 mile north of the northern part of Bear Head Lake. Both localities are within the zone in which white pegmatite dikes occur, but no pegmatite was observed near the holmquistite occurrences.

The presence of the lithium-bearing minerals in the area, and their apparent restriction to a definite zone warrants further investigation.

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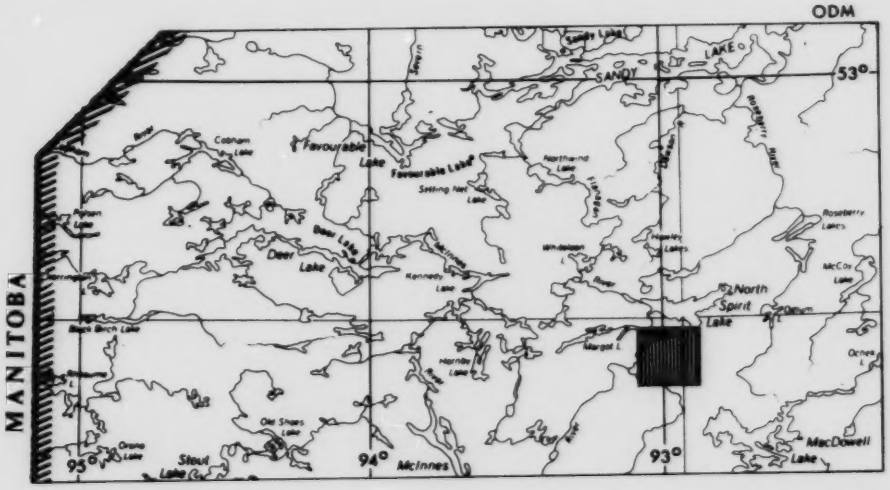
No.2 HEWITT LAKE AREA (WEST HALF)

DISTRICT OF KENORA (PATRICIA PORTION)

by

J. Wood[1]

LOCATION: The Hewitt Lake area (west half), bounded by Latitudes 52°21'30" and 52°28'45"N, and by Longitudes 92°52'30" and 93°05'W, covers the west-central part of the North Spirit Lake-MacDowell Lake metavolcanic-metasedimentary belt. The area lies about 100 miles north-northeast of Red Lake. Access is by float-equipped aircraft.



LOCATION MAP

Scale: 1 inch to 25 miles

MINERAL EXPLORATION: Initial interest in the general region was directed towards gold (Hurst 1929; Bateman 1938), but in more recent years this interest has widened to include base metals, iron, and uranium.

No exploration activity occurred during the 1972 field season, the most recent activity having been in 1969-1970 when Noranda Exploration Limited staked and carried out ground magnetic and electromagnetic surveys on a group of claims straddling the boundary of the area and the north shore of Hewitt Lake. These claims cover in part ground staked by Chimo Gold Mines Limited, that in 1964 did diamond drilling, trenching, and pitting, in the part of the

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Chimo claim group outside the field area. Although no records are present in the Assessment Work Files of the Ontario Division of Mines, evidence of prospecting activity is found in some parts of the area. There has been diamond drilling near the northwestern part of Wokokotai Lake. Individual prospectors have worked on claim groups north and south of Little Hewitt Lake, with no record of significant results. Evidence of prospecting activity in the form of pits and trenches is present west of Hewitt Lake, whereas southeast of Little Hewitt Lake there have been ground surveys and diamond drilling.

GENERAL GEOLOGY: The map-area covers the west-central part of the North Spirit Lake-MacDowell Lake metavolcanic-metasedimentary belt, which was mapped by Bateman (1938). The belt is about 12 miles long by 7 miles wide within the confines of the map-area. It is bounded by granitic batholithic rocks to the southwest, the contact running in a northwest-southeast direction, and is invaded from the northwest by a tongue of granitic rocks. Detailed mapping showed that the geology is different both in its general and detailed aspects from that represented in Bateman's (1938) map.

Within the metavolcanic-metasedimentary belt the complexity of structure combined with poor outcrop complicate stratigraphic extrapolation. Between the southwest contact with the granitic rocks and the tongue of granitic rock, a multiplicity of faults has mylonitized and sheared many of the rocks and has also juxtaposed many different rock types, making recognition of the rock stratigraphic sequence very difficult.

Between the southwest contact with the granitic rocks and the granitic tongue, there are intrusive, extrusive, and pyroclastic meta-igneous rocks, and a large variety of felsic, intermediate, and mafic flows with accompanying felsic and intermediate pyroclastic rocks. Metasediments include cobble and pebble orthoconglomerate, pebbly sandstone, grit, different types of wacke (rocks with between 15 and 75 percent fine matrix), graded wacke and mudstone, carbonate, chert, iron formation, and sulphide-bearing chert. Intermediate and felsic (minor) hypabyssal intrusions (intimately related to pyroclastic rocks of similar composition) and mafic to ultramafic intrusions also occur. Between the tongue of granitic rocks and South Bay (northeast corner of the map-area) the sequence is composed almost exclusively of clastic metasediments and intermediate to felsic pyroclastic rocks in equal proportions. Outcrop density in this general area is particularly low.

The grade of metamorphism varies from lower greenschist facies in those parts of the belt distant from the granitic contact zones to almandine-amphibolite and hornblende-hornfels facies (locally pyroxene-hornfels) near the contact zones with the granitic rocks. The higher grade of metamorphism is especially apparent near the southwest contact of the granitic tongue.

The granitic batholithic rocks are in intrusive contact with the metavolcanic-metasedimentary rocks in some areas. In other areas they are in fault contact with the metavolcanic-metasedimentary rocks. Where the contacts are intrusive, lit-par-lit injection is common and it is in the metasediments of such areas that sillimanite abounds. There are several discrete intrusive phases with compositions ranging from diorite to quartz monzonite. The older phases are mesocratic and hornblende-bearing, the younger phases are biotite-bearing and free of hornblende. A leucocratic garnetiferous phase is present

within the intrusive tongue to the northwest.

An olivine diabase dike postdates the batholithic intrusions.

STRUCTURAL GEOLOGY: The metavolcanic-metasedimentary sequence has been isoclinally folded with fold axes generally trending northwest, parallel to the western boundary of the belt. These folds have been refolded along sub-horizontal axes trending approximately east-west.

A multitude of faults belonging to two main systems are present. One system of faults trends northwest. The faults of this system are steeply dipping, have an overall downdrop to the northeast, and are accompanied by considerable shearing and mylonitization. The other system of faults trends approximately northeast. These faults are steeply dipping, have a sinistral strike separation and are tensional fractures so that little mylonitization has occurred.

ECONOMIC GEOLOGY: Traces of sulphide minerals (pyrite and pyrrhotite) were found in many rock types, but concentrated occurrences were not observed. About 20 sulphide-bearing rock samples were submitted for analysis to the Mineral Research Branch, Ontario Division of Mines, but none of these contained mineralization in economically interesting concentrations.

The sulphide minerals that were observed occurred in virtually every rock type, rather than being preferentially restricted. The possibilities of finding sulphide mineralization in economic quantities would seem reasonable, however the probability of finding concentrations of economic minerals by surface examination is low due to the very limited outcrop in the area.

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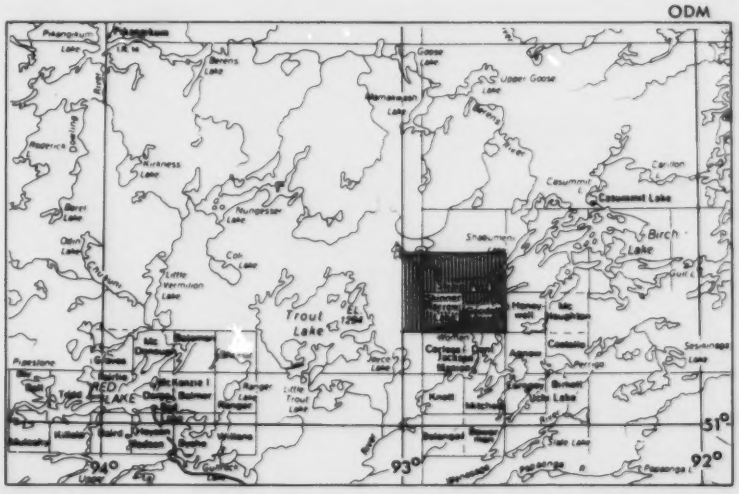
No.3 NARROW LAKE-SHABUMENI RIVER AREA

DISTRICT OF KENORA (PATRICIA PORTION)

by

A.P. Pryslak[1]

LOCATION: Mapping of Skinner Township and the area lying north of Skinner and Goodall Townships to Latitude 51°22'N and west to Longitude 93°00'W was completed. The map-area is centered about 47 miles east-northeast of Red Lake. Access is by float-equipped aircraft.



LOCATION MAP Scale: 1 inch to 25 miles

MINERAL EXPLORATION: Prospecting for gold in the Birch-Uchi Lakes metavolcanic-metasedimentary belt began in the late 1920s. There is little data available from this early exploration period on the map-area. However, numerous old pits and trenches, now largely filled with debris, were located during mapping.

The known mineral concentrations in the map-area include gold, silver, copper, zinc, lead, molybdenum, and iron.

The only recorded production is from the Bathurst Gold Mine. The mine operated sporadically between 1927 and 1937 and had a total production of

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307 ounces of gold and 92 ounces of silver (Statistical Files, Ontario Division of Mines).

During the field season, R. Frank et al. restaked the Bathurst Mine and D.F. Parrott restaked the Dunkin Mine. Noranda Exploration Limited carried out a program of geological mapping on its Narrow Lake property. G.L. Moore tested an airborne electromagnetic conductor, located southeast of Shabumeni Lake, by diamond drilling (351 feet).

Flint Rock Mines Limited holds a group of 12 leased claims on a gold showing located west of Shabu Lake and Exdeco Limited holds a group of 4 patented claims in the Carr Lake area.

Assessment Work Files of the Ontario Division of Mines indicate that the following companies have carried out exploration work of one type or another in the map-area since 1966: Cana Explorations Limited, Dickenson Mines Limited, Dome Exploration (Canada) Limited, Kendon Copper Mines Limited, Madsen Red Lake Gold Mines Limited, Noranda Exploration Limited, Northwest Explorers (1967) Limited, Selco Exploration Company Limited, Vanco Exploration of Ontario Limited, and Victoria Algoma Mineral Company Limited.

GENERAL GEOLOGY: The map-area covers the northwestern part of the Early Precambrian (Archean) Birch Lake-Uchi Lake metavolcanic-metasedimentary belt. The Shabu Lake part of the belt is separated from the main belt, near the southern end of Shabu Lake, by felsic intrusive rocks.

An arcuate fault passes through Swain Lake, west through the area about 1,000 feet north of Mousseau Lake, and west-northwest through the southeastern end of Leonard Lake. This fault effectively divides the main belt into two parts and is herein referred to as the Swain Lake Fault.

The main belt south of the fault is composed predominantly of a complex sequence of metavolcanics with minor lenses of clastic metasediments. A lower mafic metavolcanic formation, found in the southwestern part of Skinner Township, is overlain by an intermediate to felsic metavolcanic formation in the northeastern part of Skinner Township. These formations were partly mapped in 1971 and have been previously described (Pryslak 1971).

A major metasedimentary unit, consisting of pebble conglomerate, feldspathic greywacke, graphitic argillite, and iron formation, occurs in the eastern part of Narrow Lake. The unit has a maximum thickness of 2,500 feet and thins rapidly southeast towards Quartz Lake (Dent Township) and northwest to Lark Lake.

The metavolcanic-metasedimentary belt located north of the Swain Lake Fault, consists of approximately 60 percent clastic and chemical metasediments, 25 percent mafic metavolcanic flows, and 15 percent intermediate metavolcanic pyroclastic and flow rocks. Complex faulting and folding interfers with determining the thickness of the units.

Stratigraphic correlation has not been established between the metavolcanic-metasedimentary sequence north of the Swain Lake Fault and the sequence south of the fault.

The Shabu Lake Belt is composed largely of metasediments; pebble and cobble conglomerate, greywacke, marble, and calc-silicate rocks. Minor mafic metavolcanic flows are also present.

Early metamorphosed felsic intrusions, thought to be related to volcanism, occur as dikes and as a stock. The stock consists of quartz-feldspar porphyry, measures about 1 mile in diameter, and is centered 1 mile southeast of Leonard Lake. The dikes, varying from felsite to quartz-feldspar porphyry, are generally less than 10 feet in width and are most abundant in the vicinity of Shabumeni Lake.

Conformable lenses of serpentinite, up to 400 feet thick, occur in mafic metavolcanics in Skinner Township.

Dikes, sills, and irregular bodies of metagabbro and metadiorite form about 5 percent of the bedrock in the map-area. Field evidence indicates that several ages of these intrusions are present.

The main part of the belt has been metamorphosed to the greenschist facies rank with the Shabu Lake Belt and the margins of the main belt being metamorphosed to the amphibolite facies rank.

The metavolcanic-metasedimentary belt was intruded by granitic batholiths that form the boundaries of the belt. The contacts on the northern part of the belt are sharp and largely conformable. The contacts with the western boundary of the belt are largely migmatitic.

Equigranular biotite granodiorite is the dominant unit of the batholiths located west of Shabu and Bathurst Lakes. Minor pegmatite is also present. A porphyritic granodiorite (quartz phenocrysts), containing trace amounts of pyrite and numerous irregular quartz veins and pods that form up to 15 percent of the rock, intrude the metasediments and occurs along the contact between the metasediments and the biotite granodiorite west of Shabu Lake. The batholith located north of the Shabumeni River consists of a hornblende granodiorite that is equigranular in the eastern part of the map-area but becomes porphyritic in the western part with pink potassic feldspar phenocrysts ranging from 5 to 70 mm in length and forming up to 20 percent of the rock.

STRUCTURAL GEOLOGY: The dominant structural feature of the main metavolcanic-metasedimentary belt is the Swain Lake Fault already mentioned above. It is accompanied by shearing and numerous subparallel faults that generally display a left-hand strike separation. Other faults, having various trends and offsets, have been mapped in the belt.

The metavolcanic-metasedimentary sequence in Skinner Township, lying southwest of Mosier Lake, is homoclinal with stratigraphic tops facing northeast. A synclinal fold axis may lie immediately south and approximately parallel to the Swain Lake Fault, but data supporting this interpretation is incomplete.

North of the Swain Lake Fault, a northeast-trending synclinal fold axis passes through the western part of Shabumeni Lake.

ECONOMIC GEOLOGY: Most of the known gold showings in the area are found in quartz veins generally containing minor amounts of sulphide minerals. Pyrite is the most common but pyrrhotite, chalcopyrite, sphalerite, and galena occur in some of the veins. The veins occur in a variety of host rocks.

At the Bathurst Mine the quartz veins are associated with felsite dikes that trend N70W and dip 75S. The dikes vary from 2 to 5 feet in width and intrude mafic metavolcanics and metagabbro. No grade or tonnage is available on this deposit.

A gold showing occurs on the leased claims KRL51186 and KRL51184 located 0.5 miles west of Shabu Lake and held by Flint Rock Mines Limited. The auriferous quartz vein trends east, dips vertically, and occurs largely along the contact between diorite and biotite granodiorite. The vein averages 0.62 feet in width and is 600 feet in length. Sampling of the vein at 5-foot intervals returned an average grade of 0.85 ounce gold per ton (Northern Miner 1962).

An east-trending, vertical quartz vein occurs in metagabbro on the former Dunkin property. The vein is exposed over a length of 315 feet and is 15 feet wide at the western end, narrowing to 4 feet at the eastern end. Chip samples taken by the author across the western and the central parts of the vein and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained nil values in gold and silver.

Grab samples collected by the author and his assistants from 15 other quartz veins, most of which have been trenched, were analyzed by the Mineral Research Branch, Ontario Division of Mines. Fourteen of the samples contained less than 0.04 ounce gold per ton and 0.06 ounce silver per ton. One quartz vein located on the property held by R. Frank et al., 2,000 feet south-southwest of the Bathurst Mine shaft, assayed 0.17 ounce gold per ton and 0.11 ounce silver per ton. The quartz vein occurs in metasediments, averages 27 inches in width, and is exposed over a length of 28 feet. It strikes north and has a vertical dip.

A gold showing, which is on Crown Land, is located 1.75 miles north from the northern limit of the Goodall-Skinner township line. Thirty trenches, ranging in length from 4 feet to 80 feet, were found over an area measuring 900 feet by 150 feet. The original owner of the showing could not be traced and the work was probably done during the 1930s. A northwest-trending zone of carbonate alteration occurs in biotite granodiorite. The zone also contains 2 to 8 percent disseminated pyrite. Six sets of chip samples ranging from 4 feet to 20 feet in length, were taken from trenches and analyzed by the Mineral Research Branch, Ontario Division of Mines. The gold content ranged from 0.01 to 0.07 ounce per ton with trace amounts of silver.

Occurrences of massive to disseminated pyrrhotite and pyrite with trace amounts of chalcopyrite and sphalerite, are present in metasediments throughout the map-area. In metasediments at the western end of Narrow Lake, in the Shabumeni Lake area, and in the area west of Mousseau Lake, the sulphide minerals are associated largely with bedded argillites and metagreywacke, but may also form part of the matrix in metamorphosed pebble conglomerate units. In the Shabu Lake area, the sulphide minerals are in siliceous

metagreywacke and in marble. The sulphide-bearing metasediments produce numerous electromagnetic anomalies as shown by airborne surveys and although many of the anomalies have been investigated by various companies, no significant concentration of economically important elements have been discovered (Resident Geologist's Files, Ontario Division of Mines, Red Lake).

Chalcopyrite occurs in a shear zone in metasediments along the western shore of Shabu Lake, about 1,000 feet north of the leased claim-block held by Flint Rock Mines Limited. The mineralized zone trends N30W, dips vertically and ranges from 3.5 feet to 6 feet in width. At the main showing the zone is 68 feet long but trace amounts of chalcopyrite occur in minor shears south of the showing for a distance of about 1,000 feet. A grab sample of the best mineralized zone was collected by the author and analyzed by the Mineral Research Branch, Ontario Division of Mines. It contained 0.95 percent copper and 1.32 ounces of silver per ton. The same zone intersected by drilling contained 0.24 percent copper and 0.41 ounce of silver per ton over an intersection of 4.0 feet (Assessment Work Files, Ontario Division of Mines, Red Lake).

Pyrite-bearing sericite schists occur in metagabbro exposed 0.5 miles east of Carr Lake. The mineralized zones trend east and dip vertically. They range in width from 1 foot to 14 feet and have been traced, by a series of old trenches, up to lengths of 550 feet. The pyrite content averages 20 percent of the zones, which are probably sheared quartz-porphyry dikes. Analytical results on grab samples, taken by the author, are pending.

Several sheared and mineralized quartz-porphyry dikes occur in the Shabu Lake area. On claim KRL51180, held by Flint Rock Mines Limited, two drill holes were put down on a dike lying under Shabu Lake. The dike contains pyrite, ranging from 1 to 15 percent, and trace amounts of galena and sphalerite. A similar dike occurs 1,000 feet south of claim KRL51181. It is 35 feet wide, has an exposed length of 65 feet and trends S75E. This dike intrudes metagreywacke and contains up to 3 percent combined pyrite, chalcopyrite, galena, and sphalerite. A chip sample taken across a 10-foot section in the trench and analyzed by the Mineral Research Branch, Ontario Division of Mines, contained trace amounts of gold and silver, about 0.05 percent copper and about 0.02 percent lead.

Molybdenite was found in three locations in the Shabu Lake area. One showing is located on the property held by Flint Rock Mines Limited about 300 feet south of the gold showing. A porphyritic granodiorite (quartz phenocrysts) is in contact with metasediments; the contact trends S70E and dips vertically. Quartz veins in the granodiorite trend N10E and dip vertically. The quartz veins range in width from less than an inch to 4 inches, in length from several inches to about 10 feet, and are spaced at intervals of from 2 inches to about 5 feet. Trace amounts of pyrite and molybdenite occur in the quartz veins adjacent to the metasediments in a zone about 12 feet wide and 30 feet long.

Two miles north of the narrows of Shabu Lake, near the western shore, molybdenite occurs with pyrrhotite in calc-silicate rocks. The calc-silicate unit is associated with sulphide-bearing clastic metasediments and ranges in

width from 2 to 10 feet. The unit is highly folded but has a general strike of S30E and a vertical dip. Numerous quartz veins ranging from a fraction of an inch to 2 inches in width trend vertically across the calc-silicate unit. Trace amounts of molybdenite were found in the quartz veins and the calc-silicate rocks over a length of 6 feet and a width of 2 feet.

About 1,000 feet southwest of the narrows of Shabu Lake, two quartz veins carrying trace amounts of pyrite and molybdenite occur in metagabbro. The two veins are 5 feet apart and measure 2 and 8 inches in width and 4 and 2 feet in length, respectively. They trend S70E and dip vertically.

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No.4 OPERATION PICKLE LAKE

No.5 BULGING LAKE-EMBRYO LAKE AND LONGLEGGED LAKE AREAS

DISTRICT OF KENORA (PATRICIA PORTION)

by

R.P. Sage[1], F.W. Breaks[1], and W.R. Troup[2]

LOCATION: The map-area for Operation Pickle Lake as indicated in Figure 2b is bounded by Latitudes 51°00' and 52°30'N and by Longitudes 89°00' and 92°00'W, comprising approximately 13,500 square miles. Two smaller areas near Red Lake were also examined; the Bulging Lake-Embryo Lake area located west of Red Lake is bounded by Latitudes 50°45' and 51°07'30"N and Longitude 94°15'W and the Ontario-Manitoba border, comprising approximately 1,040 square miles; the Longlegged Lake area, situated south of Red Lake, is bounded by Latitudes 50°30' and 50°56'N and Longitudes 93°30' and 94°30'W, comprising 1,280 square miles. Outcrop density is generally sparse except in the Bulging Lake-Embryo Lake area and in the southwestern corner of the main project area. Outcrop density is notably poor in the northeastern corner of the main project area and in the eastern half of the Longlegged Lake area. Mapping was conducted by helicopter-supported reconnaissance and ground traversing in selected areas.

A very generalized geological map (Figure 2b) accompanies this report. The numbered areas referred to in the text are indicated on this map. The main project area was previously mapped under the Federal-Provincial "Roads to Resources" program (Carruthers 1961; Emslie 1961, 1962; Jackson 1961).

GENERAL GEOLOGY: The main project area straddles several subprovinces of the Superior Province. The northern part lies within the God's Lake Subprovince and several, generally southeast striking, metavolcanic-metasedimentary belts are present:

(1) Upper Windigo Lake Belt
(2) Horseshoe Lake Belt
(3) Forester Lake Belt
(4) Wigwascence Lake Belt

The southern half of the main project area lies predominantly within the Uchi Lake Subprovince. Several east-west- to northeast-striking metavolcanic-metasedimentary belts are notable here:

(5) Pashkokogan Lake-Misehkow River Belt
(6) Snowflake Lake Belt
(7) Osnaburgh Lake-Pickle Lake Belt
(8) Dempster Lake-Pickle Lake Belt
(9) Pickle Lake Belt

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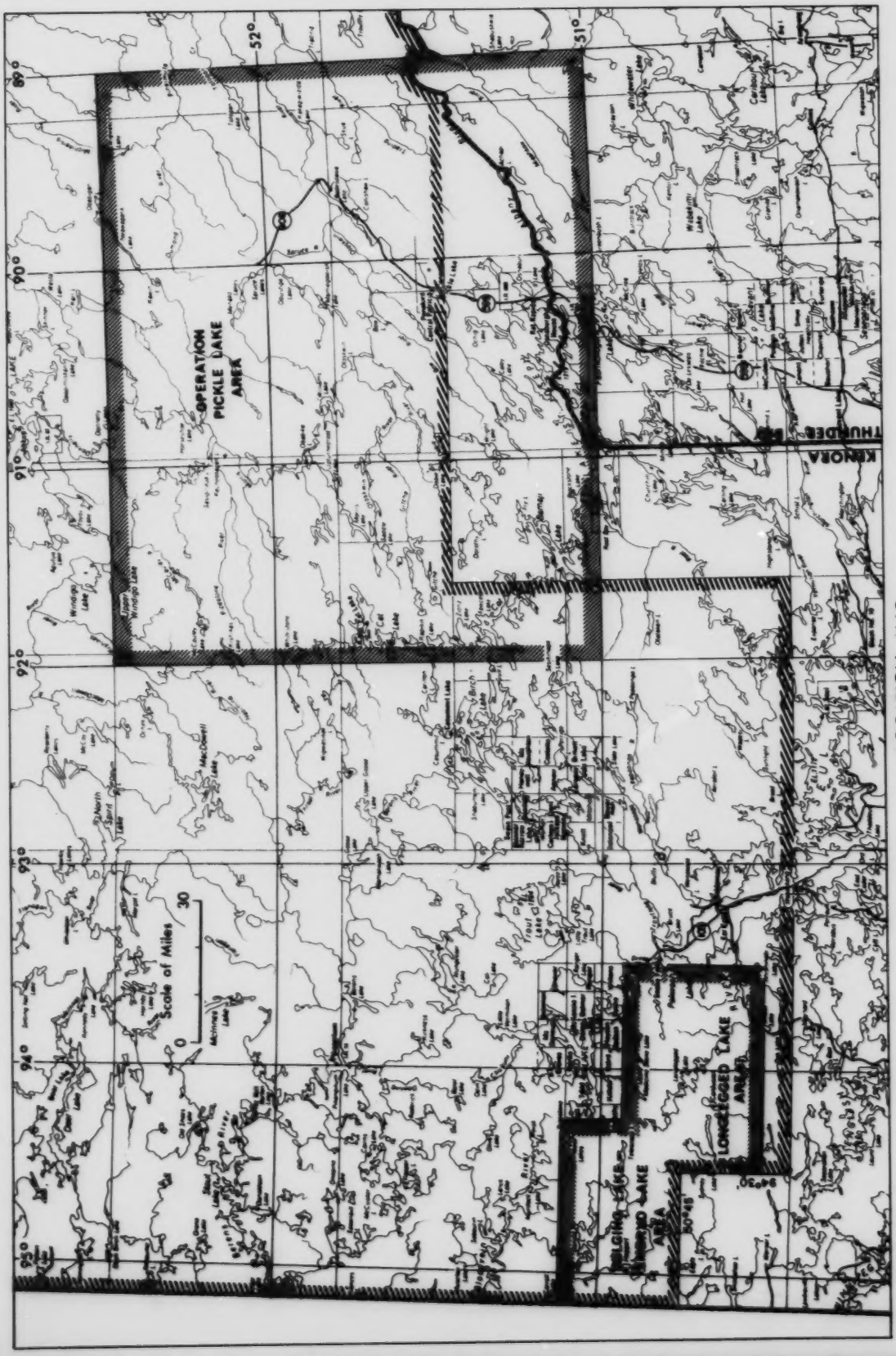
[2]Graduate Student, Department of Geology, Waterloo University.



LOCATION MAP

(10) Meen Lake-Dempster Lake Belt
(11) Bamaji Lake-Jacknife Lake Belt
(12) Lang Lake Belt
(13) Zionz Lake Belt
(14) Jackpine Lake Area
(15) Lake St. Joseph Belt

In addition, the Otoskwin River mafic pluton (16) was investigated. Many of the boundaries between the above belts are mutually coalescing and hence are arbitrary, selected only for mapping convenience. Extremities of the belts have been previously indicated (Ayres et al. 1971). Geological and boundary modifications have been made in most of the metavolcanic-metasedimentary belts of the Uchi Lake Subprovince. Along the southern margin of the main map-area, particularly in the southeastern corner of the main project area, a small part of the English River Subprovince is present.

Upper Windigo Lake Belt (1):

The Upper Windigo Lake Belt is traceable 15 miles along the Windigo River through and north of Upper Windigo Lake. Except for minor outcrops of amphibolite on Nango Lake, the eastern and southeastern parts of the belt are inferred from aeromagnetic data due to a pervasive cover of swamp and glacial material. Mafic metavolcanics predominate throughout the belt but a thin conglomerate-greywacke unit lies in the centre of the belt.

A narrow, isolated, faulted segment of the Upper Windigo Lake Belt is found to the west at nearby Shinbone Lake and is comprised of amphibolite and conglomerate-greywacke metasediments. Mapping of this area verified the work of Satterly (1939).

Economic Geology: This belt has received very little exploration attention. Prospecting possibilities have been previously discussed by Satterly (1939). Geophysical attention may be warranted in this belt especially between Nango and Sasiginaga Lakes due to an almost total absence of outcrop.

Horseshoe Lake Belt (2):

This belt is traceable for approximately 20 miles from just east of Sasiginaga Lake through the east arm of Horseshoe Lake and along Wapamisk Creek where it is truncated by a northwesterly trending fault. Best exposures are found along the east arm of Horseshoe Lake where nearly vertically dipping bedded quartzites, arkose, greywacke, and chloritic schist form a continuous unit along the south shore. Along the north shore of the east arm, sheared, in many places pillowed, chloritic intermediate metavolcanics occur in fault contact with bordering granitic rocks. To the west and south of Horseshoe Lake a large pluton of metagabbro has engulfed much of the metavolcanic-metasedimentary sequence. Exposures in the eastern part of the belt are very poor, with limited exposures of amphibolites along Wapamisk Creek. Iron formation also occurs in this area as indicated from aeromagnetic data and by drilling (D.A. Sawyer, personal communication, Great Plains Development Company of Canada Limited, 1972).

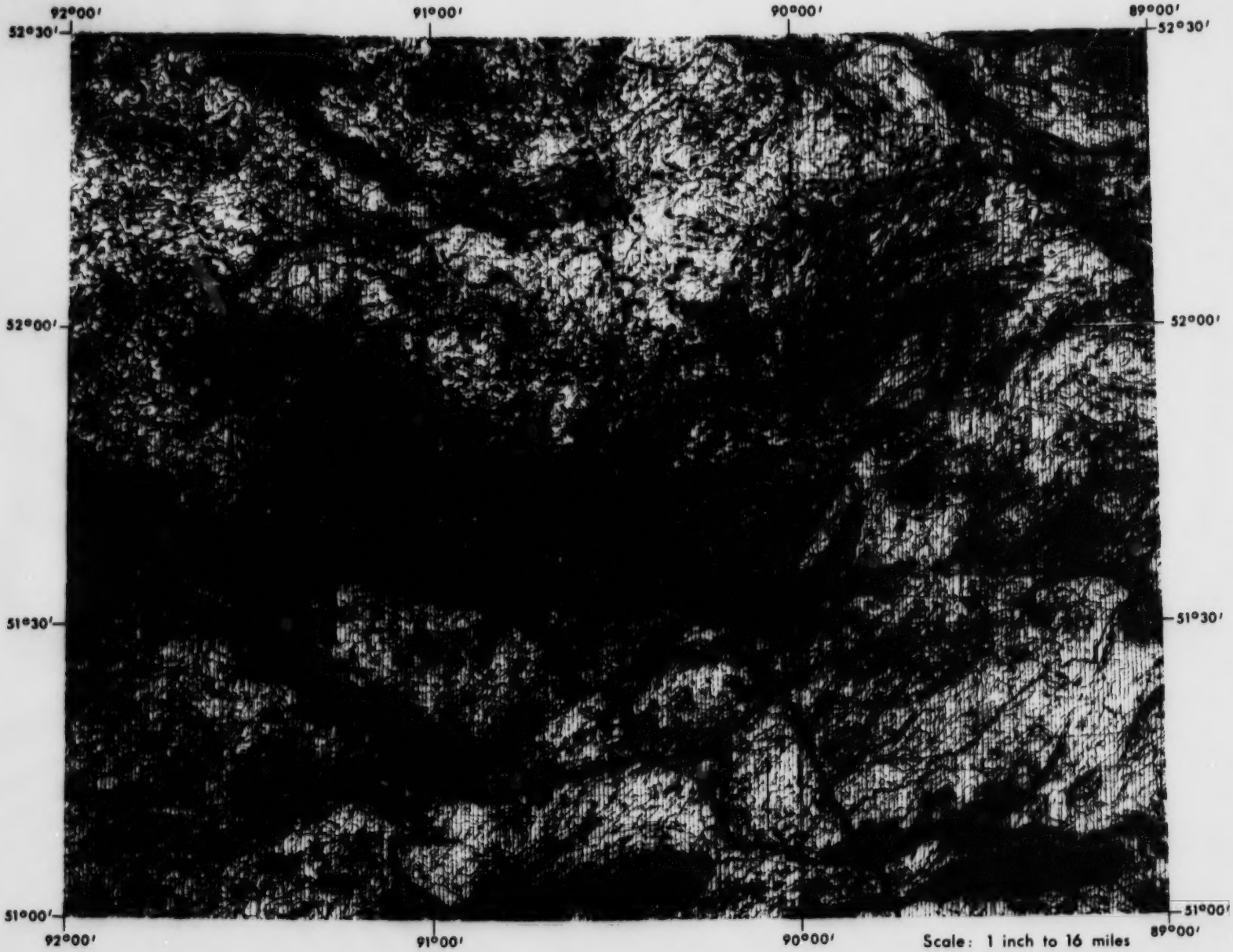


Figure 2a – Operation Pickle Lake Area, Aeromagnetic Map.

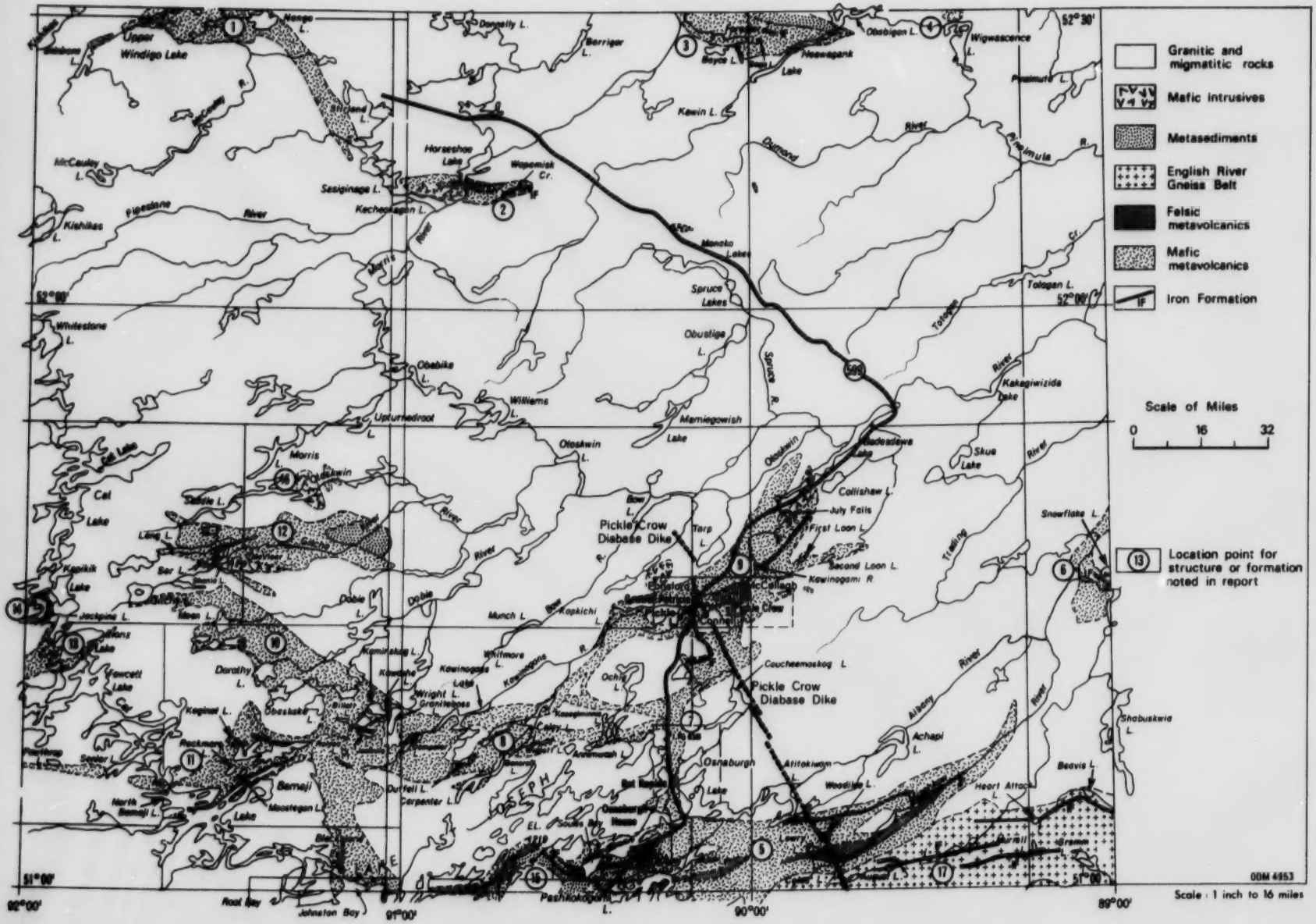


Figure 2b – Operation Pickle Lake Area, Geological Map.

Economic Geology: Regional prospecting for gold and silver was undertaken by Rio Tinto Canadian Exploration Limited during the early 1960s in the Horseshoe Lake Belt as well as the Forester Lake Belt. Several gold-silver occurrences within shear zones were investigated at this time. A massive pyrite-pyrrhotite zone, about 27 feet in total thickness, located at the southwestern end of Horseshoe Lake, occurs between chloritic pillowed mafic metavolcanics and felsic lapilli-tuff units. One shallow diamond drill hole by Rio Tinto in 1962 disclosed only minor 'values' in gold, silver, and copper (unpublished file, Rio Tinto Canadian Exploration Limited, Toronto). Great Plains Development Company of Canada Limited presently (1972) controls a large block of claims in the Horseshoe Lake Belt. A grab sample of massive, medium-grained metagabbro located near the southwestern end of Horseshoe Lake and containing disseminated grains of chalcopyrite was submitted to the Mineral Research Branch, Ontario Division of Mines, for analysis and was found to contain 0.2 percent copper. Anomalously high copper 'values' from this pluton were also recorded by the Geological Survey of Canada as a result of a reconnaissance lithogeochemical survey (Carruthers and Holman 1964).

The Forester Lake Belt (3):

This belt represents a southern extension of the North Caribou Belt. Exposures are generally limited, and confined to a great extent to Forester, Boyce, Sage, and Neawagank Lake areas. Mafic metavolcanics in the form of stretched pillowed and massive to gneissic amphibolite represent the dominant rock types. Many narrow quartz veins and lenses commonly occur throughout. Several occurrences of intermediate volcanic tuff were also noted. A quartz porphyry dike of variable width (2 to 30 feet) was observed north of Forester Lake and along the creek draining into the east end of Sage Lake. Metasediments form a continuous unit along the northern boundary of the belt. East of Neawagank Lake the limits of the belt are interpreted from aeromagnetic data (ODM-GSC Aeromagnetic Maps 937G, 947G) as widespread overburden prevails here.

Economic Geology: Earliest prospecting centered around a staking rush in the early 1940s precipitated by the discovery of favourable gold 'values' within an arsenopyrite mineralized shear zone just east of Sage Lake (Assessment Work Files, Ontario Division of Mines, Red Lake). The numerous quartz veins within this belt were thoroughly prospected during this time. Rio Tinto Canadian Exploration Limited held claim groups at the western ends of both Forester and Sage Lakes in 1962 (Assessment Work Files, Ontario Division of Mines, Toronto). Recently very little exploration attention has been given to this belt.

Wigwascence Lake Belt (4):

This belt is thought to be a deeply eroded section of a former metavolcanic belt and largely consists of isolated relict blocks of amphibolites within granitic mobilizate. Only one east-west-trending narrow continuous band of amphibolite was noted; this band is mainly outside of the map-area.

Pashkokogan Lake-Misehkow River Belt (5):

This belt is composed predominantly of mafic metavolcanics, which display primary structures in many places. Local units of intercalated metasediments occur and near the northern margin, aeromagnetic data (ODM-GSC Aeromagnetic Maps 922G, 932G) in corroboration with limited exposures, indicate the presence of iron formation. From aeromagnetic interpretation and scattered outcrop data a felsic to intermediate metavolcanic unit is thought to exist south of the Misehkow River. This unit is about 3 miles wide where it crosses the Misehkow River south of Lowry and Woodilee Lakes. To the west the felsic metavolcanics continue into the Pashkokogan Lake area where previous mapping by Goodwin (1965) has documented similar rocks. Isolated felsic volcanic outcrops display a well-defined pyroclastic structure. Metamorphic grade of the metavolcanics and metasediments increases from upper greenschist facies to lower amphibolite facies towards Pashkokogan Lake. Exposures of the Pickle Lake diabase dike (200-300 feet wide) occur at Atikokiwan Lake and Coles Lake.

Outcrop data suggests that the Pashkokogan Lake-Misehkow River Belt does not connect with aeromagnetically inferred metavolcanics in the Snowflake Lake area. From limited pillow top data it is postulated that the belt is dominated by a major synclinal structure. To the south, rocks of this belt are in possible sheared contact with metasediments of the English River Subprovince.

Economic Geology: An iron prospect having a calculated tonnage of 71,160,000 tons to the 500-foot depth and averaging 21.0 percent iron has recently been outlined by Sturdy Mines Limited in the Misehkow River area (Assessment Work Files, Ontario Division of Mines, Toronto).

Considerable diamond drilling has been carried out in the Lowry Lake-Pashkokogan Lake area mainly by Selco Exploration Company Limited and Canadian Nickel Company Limited.

Snowflake Lake Belt (6):

Only one outcrop was located in this belt. This exposure is on the Albany River and consists of massive mafic metavolcanics, a thin felsic to intermediate tuff unit (too small to show on sketch map), and a 30-foot wide unit of banded iron formation.

The shape and limits of this belt have been interpreted from aeromagnetic data (ODM-GSC Aeromagnetic Map 943G).

Osnaburgh Lake-Pickle Lake Belt (7):

This belt merges to the south with the Lake St. Joseph Belt and to the north with the Pickle Lake Belt. Amphibolitized mafic metavolcanics constitute the predominant lithology with pillow structures commonly discernable although generally in such a deformed state as to preclude a plausible structural interpretation for the belt. At Osnaburgh House exposures of isolated pillow breccia, with interpillow bombs more felsic in

composition, are apparent. Along Highway 599, 80 miles north of Savant Lake (south of map-area) a spectacular exposure of volcanic breccia with fine-grained felsic fragments in a medium- to coarse-grained mafic matrix is present. Several small isolated coarse-grained metagabbroic masses are also present.

Minor, intercalated, in many places interdigitating metasediments occur between the pillowed flow units especially in the Osnaburgh House area. At the water-level control dam east of Osnaburgh House, along the eastern shore of Lake St. Joseph, exposures of well developed analusite-sillimanite porphyroblasts are noteworthy.

Economic Geology: Very few sulphide mineral occurrences have been documented within this belt and prospecting has generally been minimal although UMEX (Union Miniere Explorations and Mining Corporation Limited) have recently been active in the Couheemoskog Lake area (Assessment Work Files, Ontario Division of Mines, Toronto).

Dempster Lake-Pickle Lake Belt (8):

This belt consists of two units of metavolcanics and metasediments separated by granitic rocks south of Ochig Lake.

Towards the east, this belt merges with the Osnaburgh-Pickle Lake Belt and to the west it coalesces with the Meen Lake-Dempster Lake Belt. Mafic metavolcanics predominate with local intercalations of metasediments of probable greywacke composition. Metasedimentary units consisting of biotite-quartz-feldspar schists occur on Carpenter Lake, Annimwash Lake, Wincott-Kasagiminnis Lakes, and Whitmore Lake. A 250-foot thick conglomerate unit occurs on Wincott Lake. A granitic pluton has been delineated on Duffell Lake. Because of poor exposure the extent and shape of this belt is, to a large degree, based on aeromagnetic data (ODM-GSC Aeromagnetic Maps 913G, 923G). Stratigraphic information is insufficient to permit a meaningful structural interpretation.

Economic Geology: Known sulphide mineral occurrences are few. Near Bancroft Lake, the Koval-Ohman gold prospect was investigated during 1953-1954 by Hasaga Gold Mines Limited. Eighty-seven drill holes, totalling 20,885 feet, outlined 149,000 tons averaging 0.19 ounces gold per ton and 41,000 tons averaging 0.14 ounces gold per ton (Assessment Work Files, Ontario Division of Mines, Toronto). No development has since taken place.

Pickle Lake Belt (9):

The Pickle Lake Belt is characteristically ramiform consisting of a number of branches and lobes of metavolcanic rocks of predominantly mafic composition. One branch extends east of the former Pickle Crow Mine site to the First and Second Loon Lakes and gradually merges eastward with a migmatitic zone. A second branch extends north to July Falls and a third extends north of Tarp Lake. To the south the Pickle Lake Belt merges with the Osnaburgh Lake-Pickle Lake Belt. Southwesterly it appears to taper gradually, and is probably connected with metavolcanic rocks

southeast of Wright Lake. Intercalated metasediments, felsic to intermediate pyroclastics, and contorted banded iron formation are widespread near the Pickle Crow Mine site.

At July Falls on the Kawinogans River a mafic intrusive stock of gabbro-quartz diorite is notable. Several small masses of ultramafic rocks have been delineated in the Kapkichi Lake area by Kapkichi Nickel Mines Limited and by UMEX, largely by diamond drilling. Mafic metavolcanics, minor metagabbro, and a thin unit of felsic to intermediate metavolcanics occur at the southern end of Kawinogans Lake. Possibly the latter is continuous with a felsic sequence mapped in the Dempster Lake area.

Economic Geology: From 1935 until its closing in 1966, the Pickle Crow Gold Mine produced 1,446,214 ounces of gold and 168,757 ounces of silver for a total value of $52,376,169 (Ferguson et al. 1971, p.202-203). From 1935 to 1951 the nearby Central Patricia Gold Mine produced a total of 621,806 ounces of gold and 58,349 ounces of silver for a value of $22,920,236 (Ferguson et al. 1971, p.200-202). An important copper-nickel discovery, north of Kapkichi Lake, was recently announced by UMEX (Northern Miner 1971a) percipitating a large staking rush (Northern Miner 1971b). Approximately ten million tons of potential ore to a vertical depth of 1,500 feet have thus far been substantiated, averaging 1.68 percent copper and 0.18 percent nickel (C. Bowdidge, UMEX Corp., personal communication, 1972). A three-compartment vertical shaft is presently being excavated in order to more fully evaluate the orebody at depth.

Meen Lake-Dempster Lake Belt (10):

The rocks of this belt are mainly foliated to massive mafic metavolcanics, which locally display elongated pillows and pyroclastic zones. The belt progressively tapers and becomes increasingly migmatitic west of Meen Lake. To the east it coalesces with the Bamaji Lake-Jacknife Lake Belt (11) and with the Dempster Lake-Pickle Lake Belt (8). Very small areas of felsic to intermediate metavolcanics range compositionally from siliceous rhyolite to rocks composed primarily of saussuritized feldspar and range texturally from massive rocks to pyroclastic breccias, with ash and lapilli-tuff most common. On the basis of aeromagnetic data (ODM-GSC Aeromagnetic Maps 903G, 904G, 913G, 914G) and scattered outcrops, a unit of felsic to intermediate metavolcanics is interpreted as extending from Meen Lake to Kaminiskag Lake (too small to show on sketch map). Metasedimentary rocks consisting mainly of conglomerate and greywacke occur in the southern part of the belt. A particularly spectacular exposure of conglomerate occurs on Billett Lake.

Iron formation occurs within this belt. The best exposure is situated on the north shore of Jacknife Lake and consists of alternating bands of chert and metagreywacke, with low magnetite contents concentrated in the chert bands.

One occurrence of ultramafic rock was mapped on a small island in an unnamed lake (not shown on sketch map) between Jacknife and Kaminiskag Lakes. Southwest of Relyea Lake a massive quartz-feldspar porphyry unit is thought to be intrusive. Granitic stocks occur on Graniteboss Lake and Kawashe Lake.

From limited pillow top data and graded bedding this belt is postulated to be an isoclinally folded syncline.

Economic Geology: Very little exploration has been recorded in this belt. Jorsco Explorations Limited investigated iron formation on Meen Lake in 1960 (Assessment Work Files, Ontario Division of Mines, Toronto). Presently UMEX and Cochenour Willans Gold Mines Limited are investigating the economic possibilities in the general area.

Bamaji Lake-Jacknife Lake Belt (11):

This east-west- to northeast-trending belt is connected with the Lake St. Joseph Belt at Johnston Bay to the south and the Meen Lake-Dempster Lake Belt to the north. It is not continuous with a narrow (less than 1 mile wide) extension of the Birch-Uchi Lake Belt to the west. The boundaries of the belt, as indicated on the accompanying sketch map, are only slightly modified from those shown by Emslie (1961). The area had also been previously mapped by Harding (1935).

The belt consists predominantly of mafic to intermediate metavolcanics. Metasediments (areas too small to show on sketch map), predominantly conglomerate, are locally concentrated along the south margins of the belt grading westward into migmatites within the Bamaji-Blackstone Lake granitic batholith. A prominant metasedimentary unit consisting of greywacke and arkose is found north of Fry Lake and extends northward close to the margins of the belt.

Felsic to intermediate pyroclastics occur just north of Fry Lake and as far westward as Kaginot Lake. Similar pyroclastics are also found close to the southern margin of the belt on Bamaji Lake.

Small bodies of metagabbro (too small to show on sketch map) occur locally along the southern margins of the belt and 4 miles west of Senior Lake.

A large feldspar porphyry body approximately 2 miles by 1/2 mile in dimensions is located in the southeastern corner of Fry Lake.

Foliations within the belt trend east-west, are steeply dipping, and generally parallel to bedding. North of Fry Lake the foliations and bedding trend northward.

The extension of the Birch-Uchi Lake Belt and the Bamaji-Jacknife Lake Belt are separated by granitic rocks in the vicinity of Senior Lake. Foliation data suggests that the Birch-Uchi Lake Belt extension is a syncline plunging west and that the Bamaji-Jacknife Lake Belt is a syncline plunging east. Narrow quartz and(or) plagioclase porphyry sills, possibly related to the batholith north of the belt occur parallel to foliation.

A prominant zone of shearing trending east-west through North Bamaji-Rockmere-Moosetegon Lakes has resulted in extensive cataclasis of the felsic intrusion centered in North Bamaji Lake.

Economic Geology: The Williams-Connell-Stirrett gold prospect of 1934 (Laird 1930; Harding 1935) initially promoted interest in the Bamaji belt area. Recently, Selco Exploration Company Limited and Cochenour Willans Gold Mines Limited have been undertaking a joint project to investigate more fully the area's economic potential. An important feature revealed by the field mapping is the presence of east-west-trending quartz vein-sets containing molybdenite mineralization with subordinate amounts of pyrite and chalcopyrite pervasively associated with a high level trondhjemitic pluton in the North Bamaji-Senior Lakes area. Cochenour Willans Gold Mines Limited in 1966 investigated the Loon molybdenite prospect in the same general area. Twelve diamond drill holes totalling 2,576 feet disclosed largely subeconomic mineralization (Johnston 1968). Best analysis indicated 3.62 percent molybdenum over 2.6 feet (Assessment Work Files, Ontario Division of Mines, Kenora). Molybdenite occurring in association with east-west-trending pegmatitic veins occurs east of Fawthrop Lake and was investigated in 1969 by Madsen Red Lake Gold Mines Limited (Assessment Work Files, Ontario Division of Mines, Toronto).

Lang Lake Belt (12):

The Lang Lake Belt was not mapped during Operation Pickle Lake and data concerning this belt have been compiled from previous mapping by Fenwick (1970, 1971) and Fenwick and Srivastava (1972).

The dominant rock type is mafic metavolcanic locally pillowed or tuffaceous, with local accumulations of felsic pyroclastic rocks being present north of Shonia Lake and east and north of McVicar Lake. Thin interbeds of metasediments are common in the western part of the belt and become a major if not dominant rock type in the eastern part. The metasediments consist of conglomerate, greywacke, argillite, iron formation, and their derived schists and gneisses.

Iron formation is of widespread distribution in the area, its presence being noted both from outcrop data and linear magnetic highs on aeromagnetic maps of the area (ODM-GSC Aeromagnetic Maps 894G, 904G).

An intrusion comprising gabbro, diorite, anorthosite, and anorthosite gabbro extends from the east shore of Sor Lake to 3 miles east of McVicar Lake.

A quartz-feldspar porphyry intrusive is located between Shonia Lake and McVicar Lake and, along the south margin of the lobe of metavolcanics 1-1/2 miles south of McVicar Lake, a feldspar porphyry unit approximately 1,000 feet in width was located during the present survey.

An eastward plunging syncline has been interpreted largely from pillow top data.

Economic Geology: Discovery of gold in 1928 on the Smith-Watson group first served to create interest in this belt (Laird 1930). Numerous additional discoveries of sulphide mineralization have stimulated a surge of mining exploration activity in recent years. Extensive low grade copper-molybdenite

mineralization has been recently outlined by The Hanna Mining Company in the Lang Lake area. Interesting massive to disseminated chalcopyrite-pyrrhotite mineralization within a porphyritic metagabbro pluton occurs at a sheared contact with mafic metavolcanics west of McVicar Lake. A number of mining groups have investigated this prospect, the most recent being New Jersey Zinc Explorations Company (Canada) Limited (Assessment Work Files, Ontario Division of Mines, Toronto).

Zionz Lake Belt (13):

The Zionz Lake Belt is the northeastern extension of the Birch Lake-Uchi Lake Belt. Within the map-area the belt consists predominantly of foliated to massive amphibolites of mafic volcanic origin. Along the southeastern margin of Zionz Lake a thin band (50-200 feet wide) of felsic metavolcanics can be found (too small to show on sketch map). On the northeastern margin of Zionz Lake possible metasediments of greywacke composition occur.

Within the centre of the belt and occupying most of Zionz Lake is a massive, locally porphyritic, granitic pluton.

East of Zionz Lake isolated blocks of migmatized amphibolite suggest the possibility that the Zionz Lake Belt was once connected to the Meen Lake-Dempster Lake Belt.

Economic Geology: Very little exploration has been recorded in this belt. Fort Reliance Minerals Limited carried out trenching, geological mapping, and geochemical work on a copper-nickel showing on the eastern shore of Zionz Lake in 1969 (Assessment Work Files, Ontario Division of Mines, Toronto).

Jackpine Lake Area (14):

An arcuate unit of amphibolite, of probable mafic volcanic origin, occurs east of Jackpine Lake. A concordant unit of highly metamorphosed felsic volcanics occurs within the amphibolite. Locally the volcanics are contorted and highly injected with granitic material. A granitic intrusion is thought to be present on the concave side of the arc generally centered over Jackpine Lake.

Lake St. Joseph Belt (15):

Geology of this belt has been previously documented by Clifford (1969) and by Goodwin (1965). Field mapping confirmed the general geology and structure although numerous local disparities in the location and naming of rock units were apparent. Metamorphic grade of the belt appears to increase towards Osnaburgh Lake.

Economic Geology: Main interest has centered around the presence of iron formation. A large, potentially important iron deposit has been substantiated by Steep Rock Iron Mines Limited in the Soules Bay area on Lake St. Joseph. Approximately 683 million tons varying between 22.2 percent and

23.8 percent soluble iron have been indicated to a depth of 500 feet within the preliminary open-pit designs (Taylor et al. 1972).

Otoskwin River Mafic Pluton (16):

The Otoskwin River mafic pluton consists of massive metadiorite or metagabbro. Locally in the centre of the mass a noticeable increase in the biotite content occurs. Accessory magnetite in amounts up to 10 percent is common throughout the body.

East along the Otoskwin River a thin zone of migmatized amphibolite, possibly of mafic volcanic origin, cuts across the river.

English River Subprovince (17):

Best exposures of English River Gneiss Belt-type metasediments are found in the southeastern corner of the main project area. Medium- to fine-grained, foliated to gneissic, biotite-quartz-white feldspar ± garnet rocks are typical. In a very few places, sedimentary bedding is locally preserved, as on the western shore of Murrell Lake. Ubiquitous white pegmatitic masses invade the metasediments and form at least 25 percent of the outcrops.

Economic Geology: A salient feature of the English River Gneiss Belt in this region is the abundance of iron formation in proximity to the regionally curvate contact with the Uchi Lake Subprovince to the north. The iron formation commonly consists of alternating bands of magnetite and metagreywacke. Three major aeromagnetically distinct iron formation horizons are evident (ODM-GSC Aeromagnetic Maps 932G, 942G). Exploration attention has been given to virtually all of the important iron formation during the past 12 years especially at Heart Attack Lake, Beavis Lake, and August Lake, most notably by The Algoma Steel Corporation Limited (Assessment Work Files, Ontario Division of Mines, Toronto and Kenora).

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No.6 CONANT, JUTTEN, AND SMYE TOWNSHIPS

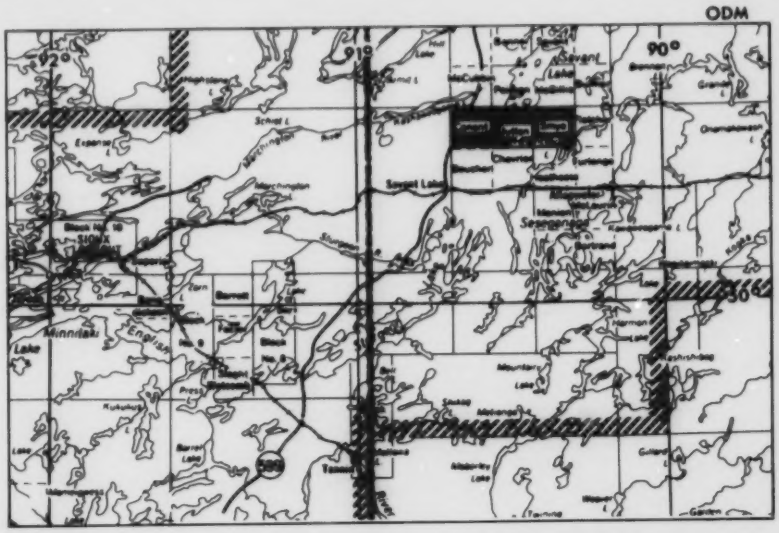
(SAVANT LAKE AREA)

DISTRICT OF THUNDER BAY

by

W.D. Bond[1]

LOCATION: The area mapped includes Conant, Jutten, and Smye Townships, which are situated approximately 150 air miles north-northwest of Thunder Bay. Highway 599 runs north from the Town of Savant Lake (located 8 miles



LOCATION MAP Scale: 1 inch to 25 miles

to the south of the map-area) through Conant Township and provides easy access. In addition the numerous lakes and streams within the area afford easy access by float-equipped fixed-wing aircraft and by canoe. The three adjoining townships have a total area of 108 square miles.

MINERAL EXPLORATION: Prospecting for precious minerals in this area has been going on since the turn of the century, however, until recently, little of this work was recorded in the Assessment Work Files of the Ontario Division of Mines.

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According to E.S. Moore (1929, p.73-74), the area in the vicinity of Stillar Bay was prominent during the early years of exploration. In 1927, the Savant Mines Limited was responsible for much of the work done in developing a gold showing just north of the east end of Stillar Bay. Northern Canada Mines Limited later re-examined this same property but discontinued work on it when drilling gave disappointing gold 'values'. Northern Canada Mines Limited also staked four patented claims (TB37809, TB37812, TB37814, and TB37942) in central Jutten Township in conjunction with a more promising gold showing in 1948-1949. There, surface work indicated a 185-foot section averaging 1.81 ounces of gold per ton over 2.0 feet.

Only minor base metal exploration was carried out prior to 1965. Since 1969 the entire region has received considerable attention from the mining companies and this is most probably a reflection of the discovery of the Mattabi Mine on nearby Sturgeon Lake.

John Donner, representing Bird River Mines Company Limited, has controlled a large group of claims in Jutten Township since 1958. Geological sampling was carried out and a reconnaissance geophysical survey was done in 1963 on this claim group. This was followed up by 1,000 feet of diamond drilling in 1965, further sampling in 1969, and detailed geophysical surveys during the 1971 and the 1972 field seasons.

The Algoma Steel Corporation Limited conducted a magnetometer and geological survey of the iron-bearing sediments just south of Kashaweogama Lake in 1967.

During the years of 1968, 1970, and 1971, The International Nickel Company of Canada Limited did some diamond drilling in Jutten and Conant Townships.

CAM Mines Limited holds title to a 29-claim group in the southwestern corner of Conant Township near Harold Lake. No exploration work has been recorded as yet although a report in the Assessment Work Files of the Ontario Division of Mines in Toronto has recommended that a detailed geological mapping, geophysical, and diamond drilling program be undertaken.

From 1970 to 1971, Noranda Exploration Limited carried out an extensive geophysical survey of a large group of claims in Conant Township. Twelve diamond drill holes were sunk for a total of 3,404 feet.

Falconbridge Nickel Mines Limited holds title to 6 claims in central Conant Township and carried out a geophysical survey on them in 1971.

In the winter of 1971, Langis Silver and Cobalt Mining Company Limited did a combined magnetometer and electromagnetic survey on a group of claims in Smye Township.

Particularly active in the last two years was Mid-North Engineering Services Limited who, in conjunction with four other companies, undertook an extensive geophysical survey and detailed geological sampling of a large group of claims in northern Jutten and Smye Townships.

Also active during the 1972 field season were Hudson's Bay Oil and Gas Company Limited and Hudson Bay Mining and Smelting Company Limited.

GENERAL GEOLOGY: Previous mapping by Moore (1928), Rittenhouse (1936), and Skinner (1969) established that the area is underlain by Archean rocks which consist of a sequence of mafic to felsic metavolcanics. Intruded into these is a dioritic to gabbroic stock and granitic bodies of various compositions.

The oldest rocks in the map-area are exposed along the northern parts of Jutten and Smye Townships and consist of a thick sequence of mafic to intermediate, fine- to coarse-grained flows and pillowed lavas. In places, i.e. near the contact with the granitic batholith to the south, these rocks have become almost completely amphibolitized. The pillow lavas, estimated to make up at least 75 percent of the sequence, are massive and poorly formed making top determinations difficult. A few porphyritic flows occur in places and could be intrusive in part.

Lying stratigraphically above this metavolcanic sequence is a conglomerate which in turn is overlain by finer grained metasediments. The conglomerate is heterogeneous, ill-sorted, and characterized by large coarse-grained quartz-feldspar porphyry plutonic boulders near the base. Towards the top the conglomerate becomes more volcaniclastic in character. The sedimentary rocks immediately above the conglomerate are tuffaceous in character but become more clastic in nature grading upwards and are associated with iron formation near the top of the sedimentary sequence.

The area west of Savant Lake, comprising Conant Township, is underlain by a sequence of felsic to intermediate flows and pyroclastics with intercalated metasediments and tuffaceous metasediments. Quartz-feldspar porphyry rocks are particularly abundant in the vicinity of Handy Lake and may be extrusive or intrusive.

A massive biotite, in part hornblende, diorite stock has been intruded between Staunton and Conant Lakes. This body appears to become more gabbroic near its southern margin.

Felsic to intermediate plutonic rocks, probably of several ages, underlie much of the southeastern part of the map-area. The large batholith underlying the southern area of Jutten and Smye Townships was termed a trondhjemite in the field but contains granodioritic phases.

A younger granodioritic stock has been intruded between the metavolcanic belt and this trondhjemite batholith. The granodioritic stock in the vicinity of Grebe Lake is also believed to be of a similar late origin.

STRUCTURAL GEOLOGY: Moore (1928), Rittenhouse (1936), and Skinner (1969) have recorded the most dominant feature in the area as being a great synformal structure exhibited by the metasediments and felsic to intermediate pyroclastics.

The felsic to intermediate pyroclastics and flows to the west of Savant Lake have been flexurally folded with the axis of the fold running approximately N40E just west of Handy Lake. The overall pattern is assymetrical due

to the intrusion of the Grebe Lake Stock.

Faulting occurs on all scales. The mafic to intermediate metavolcanics to the east of Savant Lake form a homoclinal structure and have not undergone the complex deformation that the previously mentioned felsic to intermediate metavolcanics have been subjected to. A major fault running through the centre of Savant Lake is thus indicated and is supported by the presence of intense shearing and moderately strong topographical lineaments.

A number of minor transverse faults are evident, the movement being dextral in most places. The most important fault runs through the southern part of Conant Township, striking at approximately N60W, and has offset the nose of the synformal fold slightly.

ECONOMIC GEOLOGY: It is the author's belief that almost all the mineralized zones in the map-area can be typified as being generally associated with secondary quartz veins and silicified shear zones. Most of these showings appear to be discontinuous and for this reason have remained uneconomic to date.

Copper-zinc mineralization associated with the metavolcanics seems to be the most promising economic target in the map-area at the present time. Precious metals such as gold and silver are found in many places in conjunction with these base metals and may also be of some importance.

A high grade test pit containing galena and silver occurs on the "John Donner" claim group near the southeastern part of the South Arm of Savant Lake. The test pit is approximately 400 feet west of the northern shore of a small lake situated between Savant Lake and Jutten Lake. The mineralization is associated with a silicified shear zone at the contact between conglomerate to the north and metavolcanics to the south. Striking at N60E and dipping from vertical to 85 degrees to the southeast, the main silicified zone with which the mineralization is associated is 10 to 12 inches wide whereas the shear zone itself has an exposed width of 5 feet but may be up to 15 feet wide. Sampling by John Donner in 1958 proved an average of 20 ounces of silver per ton across 2 feet but assay values have run as high as 50 ounces of silver per ton across a 1-foot interval (Assessment Work Files, Ontario Division of Mines, Kenora). The silver is intimately associated with galena which, along with sphalerite, is present in appreciable quantities. Only minor gold was found associated with the silver. A detailed geophysical survey along the contact would serve to delineate any further lateral continuation of the mineralized zone.

A large shear zone can be traced almost continuously along the entire north shore of Stillar Bay and runs all the way into Southeast Bay. This zone, because of its lateral extent (almost 3 miles), width (up to 1,000 feet at its widest), and numerous mineralized surface expressions, would seem to be the most promising zone, economically, in the area. Test pits are spotted throughout the zone but there are three main areas possessing a high concentration of workings and these occur near the zone's eastern flanks in the vicinity of Southeast Bay. Essentially, a series of discontinuous quartz

and carbonate veins and silicified parts with associated sulphide and gold mineralization characterize the numerous test pits. Trending from between N70E to N80E and dipping from vertical to 80N, chalcopyrite, pyrrhotite, pyrite, marcasite, galena, and gold in the form of disseminations, veinlets, and pods are associated with the quartz veins. The individual minerals would seem to be separated from each other in that they occur singly and are in places not traceable for any distance. The quartz-carbonate veins are from 3.0 inches up to 2.0 feet in width and have an observed maximum length of about 30 feet. In places the silicified zones seem to be situated along the contact of pillowed lavas and massive flows and this might be important to keep in mind during further exploration.

Approximately 1,700 feet south of Pride Lake on the Amalgamated Rare Earth property in northeastern Smye Township, a silicified shear zone occurs in pillowed lavas. The mineralized zone is exposed in three test pits and strikes approximately N85E and dips from vertical to 80 degrees to the northwest. It is 10 to 15 feet wide and can be traced along strike for approximately 200 feet. The test pits that delineate the mineralized zone are however aligned at N65E and this apparent difference from the strike of the silicified zone might indicate progressive offsetting of the mineralized vein. Numerous joints and fractures at strikes of N20E and dipping 85 degrees to the northeast are present. Chalcopyrite and pyrite are found disseminated throughout. Several float samples containing massive sphalerite and galena were found but the location of their source was not apparent in the exposure.

About 1,600 feet east of Hackett Lake in Jutten Township, a mineralized zone containing minor disseminated chalcopyrite, galena, pyrite, sphalerite, and reported gold occurs (Northern Miner 1959). This was previously mentioned as the gold showing on the four patented claims that was developed from 1948-1949. The silicified zone is curvilinear, vertically dipping, and strikes from N45E in the south to N25E in the north. The main zone is 4 feet in width, has been stripped laterally for 110 feet and can be traced discontinuously for 300 feet.

A silicified zone approximately 400 feet long and 40 feet wide strikes N30E and is located about 1,400 feet west of the South Arm of Savant Lake Disseminated, euhedral pyrite and malachite are associated with this zone. Several small quartz veins with associated py ite and chalcopyrite occur around Staunton Lake but, because of their size, do not appear to be as important economically.

Iron formation is associated with the metasediments and locally, with the metavolcanics but no economically significant deposits have been discovered.

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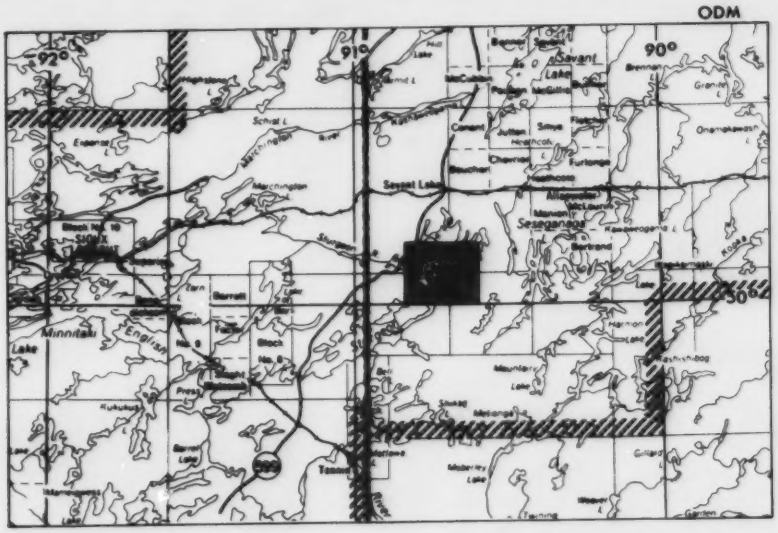
No.7 SQUAW LAKE-STURGEON LAKE AREA

DISTRICT OF THUNDER BAY

by

N.F. Trowell[1]

LOCATION: The Squaw Lake-Sturgeon Lake map-area is bounded by Latitudes 50°00' to 50°07'N and Longitudes 90°36' to 90°50'W; it covers approximately 85-square miles. The area is located approximately 60 miles northeast of Ignace. Access to the area is provided by Sturgeon Lake.



LOCATION MAP Scale: 1 inch to 25 miles

MINERAL EXPLORATION: Extensive prospecting for gold was carried out during the early part of this century, with a number of shafts being sunk and some vein material being milled.

The discovery in 1968, of a Cu-Zn-Ag-Pb sulphide deposit by Mattagami Lake Mines Limited, Exploration Division, located 12 miles southwest of the centre of this map-area resulted in the present map-area being almost completely claimed and prospected. No exploration activity, however, was observed during the past field season (summer 1972).

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[1]Geologist, Geological Surveys Section, Geological Branch, Ontario Division of Mines, Parliament Buildings, Toronto.

GENERAL GEOLOGY: The map-area is underlain mainly by Keewatin-type metavolcanics and Timiskaming-type metasediments. Although sands and gravels of glacial origin, and recent swamp accumulations, locally overlie the bedrock, outcrops are abundant.

Stratigraphically there appears to be one complete volcanic sequence (with mafic, intermediate, and felsic rocks), and one partial volcanic sequence (including only the mafic and intermediate rocks).

The lower, mafic to intermediate metavolcanic sequence is the most extensive of these two sequences in the map-area. It consists mainly of massive and pillowed flows with local occurrences of fragmental (pyroclastic and autoclastic) units.

Overlying and intercalated with this sequence is an intermediate to felsic, predominantly pyroclastic, metavolcanic sequence. This is in turn overlain and cut by the upper intermediate to mafic metavolcanic sequence that consists generally of pillowed flows and extensive fragmental flow breccia and pillow breccia units.

An unusual 'carbonate fragmental' sequence lies along the Northeast Arm of Sturgeon Lake; it is exposed on the northern and western shores of Morgan Island in Sturgeon Lake, and extends northeast to the border of the map-area. Stratigraphically, this sequence appears to lie between the felsic metavolcanics of the lower sequence and the mafic to intermediate metavolcanics of the upper sequence.

The author is at present uncertain as to the origin of the carbonate sequence. Small (1 foot by 1 foot, to 20 feet by 10 feet) circular to elliptical pipe-like bodies [diatremes(?)] of carbonate breccia (clasts of variable composition suspended in an iron carbonate matrix) were found, apparently intrusive into felsic pyroclastic breccia on the northern shore of Morgan Island. Elsewhere this sequence is massive to foliated and locally has the appearance of being bedded.

The metasediments, which are predominantly volcaniclastic in origin, form two narrow belts; one trending east-west along East Bay and then bending to the southwest along Sturgeon Narrows, and the other trending northeast, to the east of East Bay. These two belts join east of Coveney Island and form a single belt trending south through Princess and Quest Lakes.

Sills, dikes, and irregular bodies of metagabbro and metadiorite have intruded both the metavolcanic and metasedimentary sequences.

An undersaturated alkalic complex ('Sturgeon Narrows Alkalic Complex') has intruded the metavolcanics and metasediments on Coveney Island.

A granitic gneiss-migmatite terrain is exposed in the northwestern part of the map-area.

STRUCTURAL GEOLOGY: A major shear zone, with concomitant development of a penetrative schistosity, extends along the Northeast Arm of Sturgeon Lake. Locally within this zone phyllitic zones (non-penetrative) of variable width

(5 feet to 50 feet) were observed. These phyllitic zones possibly mark zones of intense deformation and movement.

Both flexual-slip and shear folding was observed. Fold axes trend approximately northeast although locally east-trending axes were observed. Within the shear zone itself folding occurred at the same time or later than the development of the penetrative schistosity.

ECONOMIC GEOLOGY: Pyrite, pyrrhotite, and locally minor chalcopyrite mineralization, generally less than 1 to 2 percent, occurs locally in most of the metavolcanic rocks.

Most of the old gold occurrences in the map-area are found in quartz veins and porphyritic granitic dikes that cut the mafic to intermediate metavolcanics. These gold occurrences contain minor amounts of sulphide minerals with pyrite the most common but with chalcopyrite locally present.

A zone of disseminated fluorite mineralization, generally less than 1 to 2 percent, occurs in the nepheline syenites south of Coveney Island along the southern shore of Sturgeon Lake.

A zone of sulphide iron formation occurs in the metasediments located north of Coveney Island. Along its strike extension the zone varies from almost pure iron sulphide to iron sulphide interlaminated with argillite. The zone is stratigraphically concordant to the surrounding metasediments indicating that, perhaps it also had a sedimentary origin (sedimentary stratiform). It consists predominantly of massive pyrite with locally a trace of chalcopyrite. A similar sulphide iron formation occurs in the metasedimentary belt east of East Bay.

Near the west end of King Bay an argillite-sulphide iron formation band occurs between two pillowed mafic metavolcanic flows. The predominant sulphide minerals are pyrite and pyrrhotite with locally minor chalcopyrite. Both the argillite and sulphide beds show the effects of soft-sediment deformation.

The metagabbro and metadiorite bodies that intrude the metavolcanics and metasediments locally contain minor amounts of pyrite and pyrrhotite.

The 'carbonate fragmental' sequence carries 1 to 2 percent disseminated sulphide minerals and magnetite, and is characterized by relatively high traces of titanium and chromium and possibly nickel.

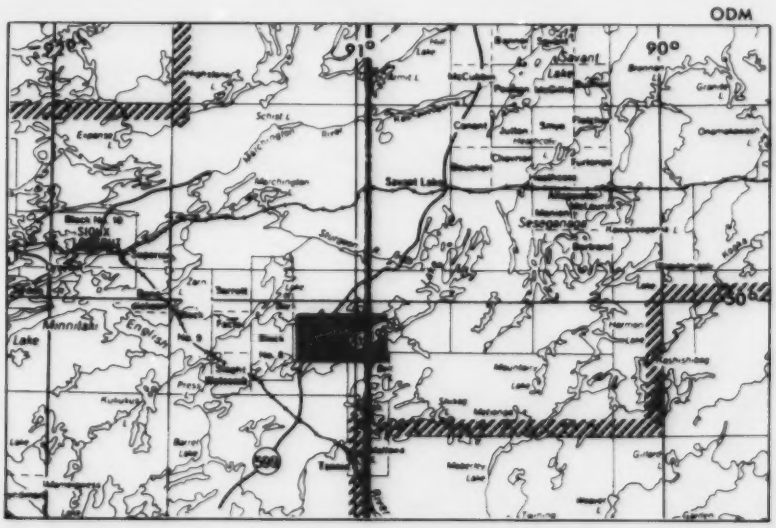
This 'carbonate fragmental' horizon is most interesting economically because stratigraphically it appears to mark the end of the first volcanic cycle, much as the Cu-Zn-Ag-Pb mineralization at Mattabi Mines Limited marks the end of the first cycle in that area.

No.8 MAGNETIC SURVEY OF BELL LAKE-STURGEON LAKE AREA (PART 1) DISTRICTS OF KENORA AND THUNDER BAY

by

Wooil Moon[1]

LOCATION: The map-area is bounded by Latitudes 49°52'30" and 49°58'N and Longitudes 90°54' and 91°11'W, and covers approximately 100-square miles. The area is about 45 miles northeast of Ignace and is readily accessible by Highway 599, which passes through the western part of the present survey area.



LOCATION MAP Scale: 1 inch to 25 miles

MAGNETIC SURVEY: The ground magnetic survey reports filed by companies with the Ontario Division of Mines for assessment work credit, and surveys donated to the project, were compiled using a common magnetic-base level in making the detailed magnetic map. The areas not covered by the company surveys were traversed at 600- to 800-foot intervals. Readings were taken at every 100 feet in general low gradient areas, and at 50 feet in high gradient areas. A compass-and-chain method was used to run the survey, and air photographs at a scale of 1 inch to 800 feet were used to provide location control for the traverses.

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The instruments used were one Sharp MF-1-100, one Sharp MF-2, and one McPhar M-700 magnetometers. Diurnal variations of magnetic field were recorded with a Rustrack 88 recorder and McPhar M-700 magnetometer powered by a 12-volt automobile battery.

Magnetic susceptibility measurements were made on overburden materials and on all the major rock types occurring in the area, utilizing a Bison 3120 'in situ' coil. The magnetic survey on Sturgeon Lake was carried out with a navigational technique developed by Peter Mark of the Ontario Division of Mines. A few resistivity vertical profiles are included in the survey to show general electric properties of the lithologic units in the area.

MINERAL EXPLORATION: Due to the recent discovery and development of the Mattabi Mine in the Sturgeon Lake area, many claims in the map-area have been covered by ground magnetic and other types of geophysical surveys.

The following mining companies were carrying out geophysical surveys in the map-area during 1972: Imperial Oil Limited, The Rio-Tinto Mining Company of Canada Limited, Mattagami Lake Mines Limited, and Mattabi Mines Limited.

GENERAL GEOLOGY: Detailed geology of the area was mapped by N.F. Trowell (1970a,b) and the preliminary geological maps of the survey area are available through the Publications Office of the Ontario Division of Mines.

The survey area covers only a small part of the Sturgeon Lake-Savant Lake geosynclinal structure but the contoured final map and the interpretation results are expected to improve understanding of the regional geologic structure and thereby to assist in the discovery of potential mineral deposits in the area.

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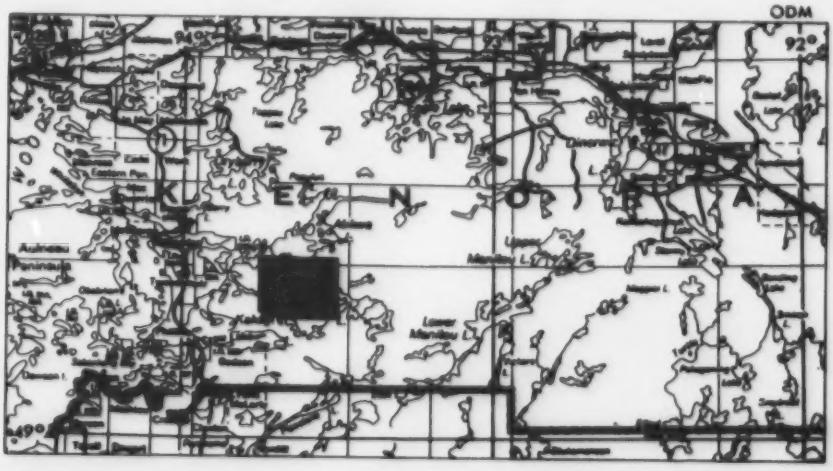
No.9 ROWAN LAKE AREA

DISTRICT OF KENORA

by

L. Kaye[1]

LOCATION: The Rowan Lake map-area is bounded by Latitudes 49°15' and 49°22'30"N, and by Longitudes 93°30' and 93°45'W, covering about 100-square miles. The centre of the map-area is approximately 52 miles southeast of Kenora, 48 miles north-northwest of Fort Frances, and 24 miles northeast of Nestor Falls air base.



LOCATION MAP Scale: 1 inch to 25 miles

MINERAL EXPLORATION: The area has attracted prospectors and mining companies in the search for gold since the beginning of the present century, and also for the base metals, copper and nickel, since 1950.

In the early 1900s, gold occurrences at the western end of Sullivan Bay of Rowan Lake (Reliance showings), and on the south shore of Rowan Lake (Monte Cristo deposit) were explored by trenching and shallow shafts. No orebodies were discovered as a result of this work.

A gold discovery made in 1936 at the eastern end of Rowan Lake sparked off a staking rush in which most of the favourable 'greenstone' belt in the

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[1]Geologist, Geological Surveys Section, Geological Branch, Ontario Division of Mines, Parliament Buildings, Toronto.

area was staked. Lakeport Gold Mines Limited acquired a group of 11 claims, which included the Monte Cristo showing, and on which exploration work was concentrated. The company did further trenching and drilled 9 holes for a total of about 5,000 feet. Gold 'values' were considered to be unfavourable and operations were discontinued.

In 1939, gold was discovered by K. McRae southeast of Wampum Lake, and Wampum Gold Mines Limited acquired a group of 22 claims in the vicinity of the occurrence. In 1940 and 1941, the company carried out a program of trenching and the drilling of 35 surface drill holes. A shaft was sunk to 200 feet on a quartz vein-bearing shear zone, and about 400 feet of lateral workings were driven. No further work or gold production was reported by the company.

In March 1968, a group of 10 claims covering the Wampum deposit was staked by R. Runzer who carried out ground magnetic and electromagnetic surveys. The claims were allowed to lapse in May 1971.

The Reliance quartz vein gold showings were re-examined in 1944 by Sylvanite Gold Mines Limited under option. A limited amount of trenching, sampling, and drilling was done, but the option was dropped.

In 1960, prospectors working for Noranda Mines Limited discovered a significant gold occurrence north of Cameron Lake and west of Beggs Lake. Noranda staked a group of about 50 claims in the Cameron-Beggs-Shingwak Lakes area. The company carried out an intensive program of exploration, which involved ground magnetic and electromagnetic surveys, trenching, and the drilling of 42 holes.

The property was allowed to lapse in 1971 at which time a group of 27 claims covering the gold showings was acquired by Golsil Mines Limited and transferred to Zahavy Mines Limited. In 1972, the latter company drilled 7 holes for a total of 2,584 feet on the property.

The discovery of a nickel-copper deposit in 1950 between Denmark Lake and Atikwa Lake generated a staking rush that spilled southwards into the present Rowan Lake map-area.

Exploration for base metals was concentrated mainly in the north-central Rowan Lake-Denmark Lake area from 1952 to 1957. During this time, a considerable amount of work involving ground geophysical surveys, geological mapping, trenching, diamond drilling, and sampling was done by a succession of claim holders and optionees among whom were Noranda Mines Limited, Selco Exploration Company Limited, Nic-Cop Mines Limited, Denlake Mining Company Limited, and Denrow Mines Limited.

Copper and nickel occurrences associated with the ultramafic-mafic intrusive-metavolcanic complex on the north shore of Isinglass Lake were examined by Dome Exploration (Canada) Limited under option agreement in 1955. Dome Exploration carried out a geophysical survey, and drilled 11 holes for a total of 6,010 feet before relinquishing the option. In 1970 and 1971, Canadian Nickel Company acquired an option on claims in the area of Isinglass Lake and drilled 9 holes for an aggregate length of 2,880 feet.

GENERAL GEOLOGY: The map-area is included in previous regional mapping by Burwash (1933), and by Thomson (1935). All the bedrock is of Early Precambrian (Archean) age. The area straddles a metavolcanic belt that has been intruded by concordant to subconcordant mafic intrusions, and granitic bodies. Rocks in the region have been metamorphosed generally to middle or upper greenschist facies rank. The distribution of rock units throughout the map-area is affected by numerous large and small folds.

The metavolcanic rocks comprise a thick platform of mafic to intermediate pillowed and massive flows stratigraphically overlain, at least in part concordantly, by a moderately thick assemblage of felsic to intermediate pyroclastic and flow rocks, within which are subordinate, intercalated sedimentary and subvolcanic quartz-feldspar porphyry units. The pyroclastic rocks exhibit an extreme range of fragmental lithology varying from bedded ash rocks, to lapilli-tuffs and coarse tuff-breccia. They lie in a zone that is complicated by folding and which trends diagonally southwest, through the central part of the map-area, from northwest of Rowan Lake, through Sullivan Bay to Cameron Lake.

Differentiated mafic sills of gabbro and anorthositic gabbro within the mafic to intermediate flows are conspicuous in the west-central part of the map-area. Locally, pyroxenite and peridotite differentiates form part of the sills. Concordant to subconcordant gabbro intrusions are also found within intermediate to felsic rock units. North of Isinglass Lake the gabbroic sills appear to coalesce with larger masses of probably consanguinous mafic and ultramafic rocks. Much of the northern part of the map-area is occupied by gabbro and related diorite and quartz diorite which is in general moderately to strongly altered; locally they are in hybrid association with included metavolcanics. A younger granitic body extends through the northern part of Rowan Lake, and Denmark Lake, and intrudes gabbroic and metavolcanic rocks.

Associated with this younger granite are agmatitic rocks, mixtures of gabbro, granite, and metavolcanics.

A discrete monzonitic-granitic stock, elliptical in plan, underlies about 12-square miles of the south-central part of the map-area.

A diabase dike with a thickness of about 100 feet strikes southeast through the extreme southwestern part of the map-area.

STRUCTURAL GEOLOGY: A large anticlinal fold, the closure (nose) of which is located to the west of Shingwak Lake, is the most prominent structure in the west-central part of the map-area. The fold axial-trace trends approximately northeast. Preliminary interpretation of available evidence suggests that a complementary syncline and anticline exist to the south. The hinge zone of the syncline, which is considerably compressed, is localized through Sullivan Bay; the southern anticline is occupied for the most part by the Nolan Lake granite stock. A penetrative schistosity associated with these fold structures strikes east to east-northeast with local, but important, deflections.

Near the northwest boundary, in the vicinity of Caviar Lake, axial traces of tight isoclinal folds strike north.

In the east-central and eastern part of the map-area, the geological structure is further complicated by small and large scale refolding of earlier fold structures.

Closely spaced, subvertical-dipping faults strike N20W and affect the rocks in the north-central part of the map-area.

A major shear zone, which strikes southeast through Cameron Lake in the southwestern part of the map-area, is the extension of a similar structure recognized west of the present map-area (Davies and Morin 1972).

ECONOMIC GEOLOGY: Numerous sulphide occurrences in the map-area contain copper and nickel mineralization. Chalcopyrite and pentlandite, with pyrite and pyrrhotite occur in shear zones, fractured zones, and as replacement products in mafic flows and mafic and ultramafic intrusive rocks. Most of the known copper-bearing sulphide showings have been found within a broad area that stretches from Isinglass Lake, eastward for about 6 miles through the north arm of Rowan Lake, to a bay on the north shore of Rowan Lake known locally as Loss Bay.

Grab samples, taken during the field season from existing trenches on sulphide showings in mafic volcanic flows, were analyzed by the Mineral Research Branch of the Ontario Division of Mines. The copper content of the samples ranges from 0.05 percent to 2.47 percent copper.

Several untested sulphide showings and occurrences of malachite staining were found by members of the field party; two grab samples taken from a 3-foot wide malachite stained zone in silicified pillowed basalt on the north shore of Rowan Lake, about 6,500 feet southeast of the dam between Rowan and Denmark Lakes, were submitted to the Mineral Research Branch, Ontario Division of Mines, and on analysis yielded 0.43 percent copper and 1.62 percent copper, respectively.

On the north shore of Isinglass Lake copper- and nickel-bearing sulphides are known to exist within or near a pyroxenite-norite-gabbro intrusive complex.

A grab sample of malachite-stained sericite schist, locally occurring in a strong shear zone that strikes southeast through Cameron Lake, in the southwestern part of the map-area, was taken by the author and analyzed by the Mineral Research Branch, Ontario Division of Mines. The sample was found to contain 0.16 percent copper. Previous drilling in the 1960s by Noranda Mines Limited on its Cameron Lake property intersected gold 'values' along a strike length of about 400 feet. The gold 'values' were reported (Noranda company files) to occur in a highly silicified zone within carbonatized gabbro and sericitized tuff and to contain 0.219 ounces per ton across an unweighted average true width of 9.2 feet, representing an indicated 37,500 tons to a depth of 125 feet. Further gold 'values' intersected by drill holes located near the Noranda occurrence are reported by Zahavy Mines Limited (Northern Miner 1972).

Elsewhere in the map-area numerous occurrences of gold are found in quartz and quartz-carbonate veins, and sulphide-mineralized schists and shear zones in volcanic flows and pyroclastic rocks.

Of about 30 samples collected by the author during the field season and analyzed for gold content by the Mineral Research Branch, Ontario Division of Mines, the most significant was a chip sample taken across a width of approximately 6 feet in rusty, schisted basalt. This sample contained 0.10 ounce gold per ton. The sample location, which is patented ground, is on the north shore of an island, about 3,000 feet southwest of the old shaft that was sunk on the Monte Cristo gold showings. Altered basalt and schisted tuff units display a continuity of strike between the latter gold showings and the above-mentioned sample location and they may yet be found to contain economic gold deposits.

Complex fold structures and shear zones, recognized in the course of the present geological survey, may exert favourable controls for gold mineralization. Several of the known gold occurrences in the map-area that are in close proximity to such structures should be re-evaluated with respect to their gold potential.

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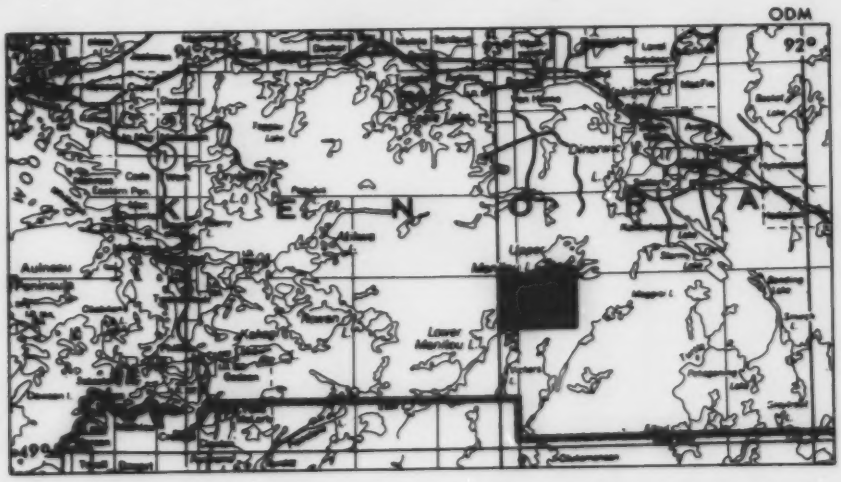
No.10 LOWER MANITOU-UPHILL LAKES AREA

DISTRICT OF KENORA

by

C.E. Blackburn[1]

LOCATION: Lower Manitou Lake lies about 36 miles south of Dryden, in the District of Kenora. The map-area is bounded by Latitudes 49°15' and 49°22'30"N, and Longitudes 92°45' and 93°00'W, and covers approximately 120 square miles.



LOCATION MAP Scale: 1 inch to 25 miles

No public roads enter the area, but a logging road originating at Dryden reaches to within 1/2 mile of the northern end of Upper Manitou Lake, near Gold Rock. Float-equipped planes may be chartered at Dryden, Fort Frances, and Nestor Falls, all of which are approximately equidistant from the map-area.

MINERAL EXPLORATION: The Manitou Lakes were the scene of considerable gold prospecting and mining activity during the period 1895 to 1912, and again in the 1930s (Thomson 1933). Many of the old prospects and mines are within the present map-area, but all have been inactive for about forty years. Claim-group patents are still held on a number of these workings: the Gaffney and Bee-Hive Mines on Manitou Island; the Royal Sovereign Mine; the Dryden-Red Lake prospect; the Merrill prospect; and the Twentieth Century Mine. Perhaps the most interesting was the Twentieth Century Mine, the precise location of

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which has been unknown for many years, but which was found during the present survey. During the period 1902-1903, 8,688 tons of ore were milled at this mine, to a total value of $43,586 (Statistical Files, Ontario Division of Mines).

Exploration for base metals is a more recent development. During the winter of 1967, an airborne magnetometer survey over 54 contiguous claims was carried out by Dominion Exploration Syndicate for Daering Explorers Corporation Limited (Assessment Work Files, Ontario Division of Mines, Toronto and Kenora). The claim group was located in the south-central part of the map-area, predominantly over metasedimentary rocks, and on its northwest side overlapping a major northeast-southwest schist zone, the Manitou Straits Fault. A number of anomalies (values above 1,500 gammas) were outlined over and along the fault zone, and over the old Glass Reef gold mine. No record of further work is present in the Assessment Work Files, but during the present survey abandoned drill core was found on a small island within an elongate high anomaly south of Beaverhead Island. Considerable magnetite iron formation is contained in the core, and present mapping has shown a distinct and mappable band of iron formation trending northeast-southwest, adjacent to the fault zone, on the southeast side of Beaverhead Island, directly beneath the elongate anomaly. It is presumed that the drilling was carried out as a follow-up to the geophysical survey. Whether any of the other anomalies were tested is not known.

During the summer of 1967 and the following winter, Kerr Addison Mines Limited carried out ground electromagnetic surveys of six groups of claims in the Manitou Lakes area; four of the claim groups lie wholly within the present map-area. The northern part of a fifth group lies partly within the map-area. Anomalies were located on four of the five groups; in the north, near Merrill Lake; in Manitou Straits; at the east end of Glass Bay; and close to the southern shore of Lower Manitou Lake, near the old Glass Reef Mine. A number of drill holes were put down to test these anomalies. Records are available in the Assessment Work Files for two holes, 150 and 47 feet long respectively, in the group at the northern edge of the map-area. Considerable amounts of pyrrhotite and pyrite were found in both holes, and weak chalcopyrite over a 2-foot section in the shorter hole. A 200-foot hole put down in the Manitou Straits intersected graphitic tuffs and very minor pyrite and pyrrhotite. There are no records of other drill holes in the Assessment Work Files.

During the spring of 1970, a combined airborne electromagnetic survey and magnetic survey was flown by Questor Surveys Limited for Freeport Canadian Exploration Company over Straw Lake, Eagle Lake, and the Manitou Lakes as a joint venture with Beth-Canada Mining Company. In the Manitou Lakes, significant electromagnetic anomalies were located at two places within the present map-area. One of these was a quarter mile to the southeast of, and parallel to, the anomaly located by the Kerr Addison ground electromagnetic survey. The other was in Manitou Straits, at the same locality as, but longer than, that picked up in Kerr Addison's ground survey. No follow-up program was carried out on these anomalies.

In February of 1971, the Canadian Nickel Company Limited drilled a 600-foot hole on a group of six claims on the southeastern shore of Lower

Manitou Lake, probably on a northeast extension of an anomaly located by Kerr Addison. Scattered pyrite mineralization was found throughout a 330-foot section of mafic volcanic rocks followed by 100 feet of schist.

GENERAL GEOLOGY: The Lower Manitou-Uphill Lakes area was previously mapped as part of a reconnaissance survey extending from Lower Manitou Lake to Stormy Lake, some 20 miles to the east, by Thomson (1933). The geology as delineated by Thomson's survey is incorporated in the Kenora-Fort Frances compilation map (Davies and Pryslak 1967).

Bedrock is of Lower Precambrian (Archean) age, and consists of thick volcanic and sedimentary sequences intruded by porphyry dikes, granitic stocks, and granitic rocks of marginal batholithic domes. The Manitou Lakes-Stormy Lake metavolcanic-metasedimentary belt is arcuate in form, approximately 12 miles in width, and some 50 miles long, tapering at either end, and joining on its north side with volcanic rocks extending northward toward Dryden. The present map-area is situated at the southwestern end of the belt. Within the map-area the thick volcanic and sedimentary sequences are intruded by two granitic stocks, and bordered to the northwest by granitic and gneissic rocks of the Atikwa-Niven dome (Goodwin 1965).

The belt may be conveniently divided into two areas separated one from the other by the Manitou Straits Fault, a major schist zone trending northeast-southwest through the middle of the belt, and diagonally across the map-area. Geological successions on either side of the schist zone differ substantially, and are summarized in the following table:

Northwestern Sequence

Unit		Estimated Thickness in feet
SE		
7.	Mafic pyroclastic rocks	1,300
6.	Pillowed and porphyritic basalt	3,200
5.	Intermediate pyroclastic and mafic volcanic rocks	2,100 to 6,000
4.	Medium- to fine-grained basalts at base, passing upward to pillowed basalts and breccia (contains a 1,000-foot sub-unit of coarse mafic volcanic rocks)	
3.	Amphibolite	1,300
2.	Pyroclastic and amphibolitic rocks	500
1.	Migmatitic amphibolite, migmatitic pyroclastic rocks, and dioritic hybrid rocks	2,300
NW		

Southeastern Sequence

Unit		Maximum Thickness in feet
NW		
7.	Interbedded polymictic conglomerates and graded sandstones and argillites. Local magnetite iron formation	2,000
6.	Volcaniclastic conglomerates and minor sandstones and argillites	4,000
	Local Unconformity	
5.	Pillowed basalts and minor mafic breccia	4,000
4.	Fine-grained clastic sedimentary rocks, tuffs, and interbanded mafic flows	2,000
3.	Coarse- to medium-grained mafic volcanic rocks with pillows in a few places	5,500
2.	Pillowed and massive basalts	10,000
1.	Amphibolite with minor pillow remnants	8,000
SE		

The northwestern sequence is intruded by many feldspar porphyry dikes (mainly trending northeasterly), particularly on Manitou Island in Lower Manitou Lake. A small granitic stock intrudes Unit 5 at Carleton Lake in the north-central part of the map-area.

Voluminous amounts of feldspar porphyry occur within and are probably intrusive into Units 6 and 7 of the southeastern sequence, the Manitou Series of Thomson (1933). They are related to porphyry dikes within the volcanic sequence. Coarse mafic rocks occupy a sill-like body within the Manitou Series. A porphyritic quartz monzonite body, the Uphill Lake Stock, intrudes volcanic and sedimentary rocks of the southeastern sequence in the vicinity of Uphill and Scattergood Lakes in the northeastern part of the map-area.

STRUCTURAL GEOLOGY: Regional structural trend throughout the volcanic and sedimentary rocks is northeast-southwest. Abundant primary structural criteria indicate that the volcanic-sedimentary sequences comprise two monoclines, facing each other across the northeast-southwest-trending Manitou Straits Fault. Schist zones similar to that defining the major fault also occur within the upper part of the northwesterly sequence, possibly either attenuating the stratigraphy, or causing repetition of some parts of the sequence. Intense lineation, plunging steeply in the plane of the schistosity, is characteristic of the schist zones. A regional syncline is not necessarily implied from these structural data.

Broad, open, fold structures are indicated by pillow facings within the thick lower mafic sequence in the southeast, but repetition within the pile by folding is not established.

Intrusion of the Uphill Lake Stock has imparted a foliation and local increase in metamorphic grade on volcaniclastic rocks close and parallel to its margins.

ECONOMIC GEOLOGY:

Gold: Gold occurrences were invariably associated with quartz veins, predominantly within mafic volcanic rocks, and usually in association with pyritic sulphides. Tourmaline, ankerite, and chlorite appear to be associated with the gold in many places. Further discussion of the gold and its associations is amply covered by Thomson (1933).

Molybdenite: Disseminated molybdenite was found in quartz veins within granitic rocks of the Atikwa-Niven Batholith, close to their contact with migmatitized mafic volcanic rocks, on the western shore of Olsen Bay of Lower Manitou Lake.

Iron: Banded magnetite iron formation occurs at the southeast end of Beaverhead Island. Layers of what appears to be almost pure magnetite, varying in thickness between 1/2 inch and 1 foot, alternate with layers of argillitic or volcanic rock of similar thickness in two units, each about 30 feet wide and 30 feet apart. These units are traceable along strike for at least 1/2 mile. Aeromagnetic data (ODM-GSC 1961) suggest that the iron formation may extend another 1/2 mile or more to the southwest, beneath Upper

Manitou Lake. The iron formation could not be traced to the northeast, on the mainland, and is probably cut out by the Manitou Straits Fault.

Pyrite: Accessory pyrite is ubiquitous throughout the mafic volcanic and pyroclastic rocks, and is present in many places in the sedimentary rocks. Although not of economic interest itself, it may be of importance in indicating areas of potential copper-sulphide mineralization, especially where it occurs in concentrated amounts. Pyrite concentrations are characteristic in country rock at the Gaffney and Bee-Hive Mines on Manitou Island, in shear zones close to the Glass Reef Mine, and in clastic intra-volcanic sediments at the portage from Lower Manitou Lake into Aronson Lake.

Recommendations: Ground and airborne electromagnetic surveys by Kerr Addison Mines Limited and Freeport Canadian Exploration Company have delineated a number of conductors, notably along Manitou Straits in the centre of the map-area, near Merrill Lake in the north, close to the old Glass Reef Mine in the southwest, and at the east end of Glass Bay in the southeast. All of these conductors appear to trend northeast-southwest, parallel to regional structure. The conductors in Manitou Straits and near the Glass Reef Mine may be associated with shear and schist zones, and related to graphitic alteration. Such shear zones could also be the sites of remobilized concentrations of sulphide minerals. Information in the Assessment Work Files for drill holes put down on conductors near Merrill Lake suggest that pyrrhotite was the cause of the anomalies. No information is available for holes put down on conductors at the east end of Glass Bay.

The finding of molybdenite near Olsen Bay, associated with quartz veins, is of interest in that deposits may occur along or near the plutonic-volcanic contact zone. Molybdenite has been found in a similar position north of Upper Manitou Lake, near Harper Lake (Davies and Pryslak 1967), along the same contact zone. Further search should be made along this contact for molybdenite.

Coarse-grained, gabbroic rocks, which could be intrusive into, but essentially contemporaneous with, mafic volcanic flows, occur in volume in both the northwest volcanic sequence (Unit 5), and the southeast volcanic sequence (Unit 3). Pillow lavas are associated with the latter, but nevertheless both are worthy of a search for nickeliferous deposits. Coarse-grained mafic rocks occur at numerous places within the mafic volcanics; most are interpreted to be centres of thick flow units.

Although little evidence of copper or zinc sulphides was found during field work, the mixed pyroclastic-volcanic flow sequence along the Manitou Straits should be investigated in this regard. Most pyroclastic rocks are intermediate to mafic in composition, but more felsic varieties occur in small amounts in the vicinity of Beaverhead Island at the southwestern end of the Straits.

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1961: Upper Manitou Lake, Kenora District, Ontario; Ontario Dept. Mines-Geol. Surv. Canada, Aeromagnetic Series, Map 1153G, scale 1 inch to 1 mile. Survey flown 1961.

Thomson, Jas. E.
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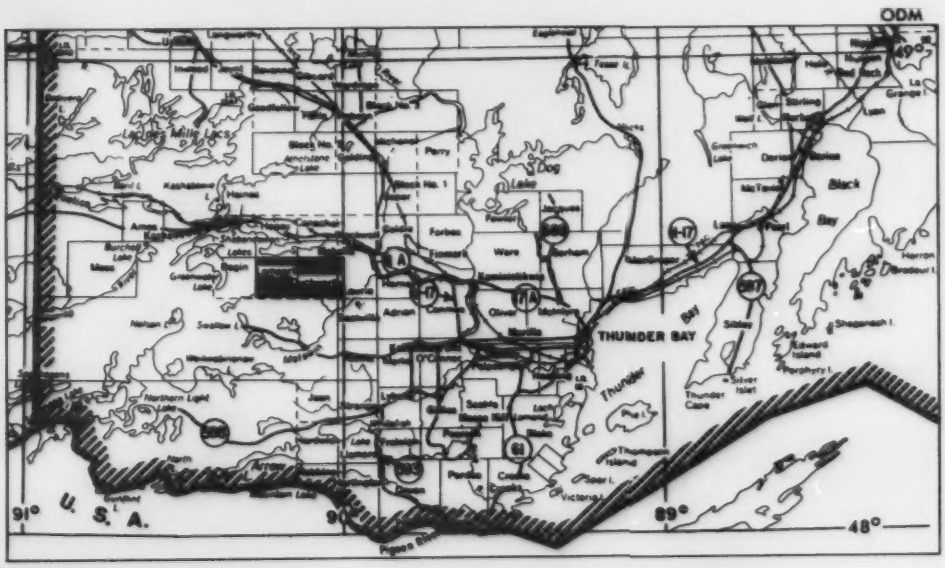
No.11 LAMPORT AND DUCKWORTH TOWNSHIPS

DISTRICT OF THUNDER BAY

by

K.G. Fenwick[1] and P. Srivastava[2]

LOCATION: Lamport and Duckworth Townships are bounded by Latitudes 48°30' and 48°35'N and Longitudes 90°01' and 90°17'W. The centre of the area lies 43 miles west-northwest of the City of Thunder Bay.



LOCATION MAP

Scale: 1 inch to 25 miles

The northern section of Lamport Township can be reached by car from the private road of The International Nickel Company of Canada, Limited. Tinto, Dakota, Kekekuab, and Peewatai Lakes in Lamport Township are accessible by float-equipped aircraft. Duckworth Township has no lakes suitable for planes. The eastern half of Duckworth Township can be reached by way of 6-mile long tracked-vehicle trails from either the dam on the Matawin River to the east or the Inco road to the north. The Gold Creek,

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flowing east from Peewatai Lake, can be used conveniently only at high water level.

Due to inclement weather and poor accessibility, only Lamport Township and the west-central and north-central parts of Duckworth Township were mapped (52 square miles).

MINERAL EXPLORATION: T.L. Tanton (1938a,b) carried out a reconnaissance geological survey of the area. J.A. Morin (1972) mapped the two townships directly to the north and J.M. Hodgkinson (1968) mapped the area to the west.

Lamport and Duckworth Townships have been extensively explored for iron, gold, and base metals. Since 1892, the Matawin Iron Range has received much attention. The Geological Survey of Canada Map, by Tanton (1938a), shows several mineral occurrences of gold and chalcopyrite in Duckworth Township and indicates that considerable prospecting was carried on prior to 1931. A resurgence of exploration in the region occurred in 1936, when The International Nickel Company of Canada, Limited purchased and drilled the nickel-copper deposit (now Shebandowan Mine) 1 mile north of Lamport Township, and again in the 1950s with the copper-gold-silver mining development, west of the map-area, of the North Coldstream Mines Limited.

Avenue Syndicate, from 1958 to 1960, carried out ground magnetometer and electromagnetic (vertical loop) surveys and did detailed geological mapping (1 inch to 200 feet) of 35 claims along the northern boundary of Lamport Township. They drilled two holes (641 feet) on these claims (Assessment Work Files, Ontario Division of Mines).

Between 1959 and 1960, Monpre Iron Mines Limited staked 9 claims around Otto Lake and carried out an airborne and ground electromagnetic survey of these claims. Five holes were drilled for a total of 1,103 feet (Assessment Work Files, Ontario Division of Mines).

Canadian Nickel Company Limited has 63 claims in the northern part of Lamport Township. In 1967, a ground magnetic survey, with follow-up electromagnetic work, was conducted over the property and outlined six zones of magnetic anomalies. From 1965 to 1969, there have been 15 holes drilled on these claims (8,249 feet). In addition, three holes (540 feet) were drilled in the northern part of Duckworth Township on claims that have since lapsed (Assessment Work Files, Ontario Division of Mines).

From 1970 to 1972, Sherritt Gordon Mines Limited worked 98 unpatented claims in the northwestern corner of Lamport Township. Several geophysical anomalies were indicated with use of ground EM unit 600 and ground magnetometers MF1 and MF2. Detailed mapping, on the scale of 1 inch to 200 feet, outlined several small bodies of peridotite. Five holes (2,604 feet) were drilled. In addition, on this claim group five holes (2,519 feet) had been drilled in 1968 on claim 131576 and two holes (1,328 feet) in 1969 on claim 131588 (Assessment Work Files, Ontario Division of Mines).

In 1971, Caltor Syndicate had a combined helicopter-borne EM and magnetometer survey flown over the southeastern corner of Duckworth Township and the southwestern corner of Laurie Township. As a result between 1971 and 1972 geological and ground geophysical surveys and follow-up drilling was undertaken on 82 claims in Laurie Township (unpublished private report for Caltor Syndicate).

Noranda Exploration Limited holds 20 claims in the vicinity of the Duckworth-Laurie township boundary. Ground magnetometer and electromagnetic surveys were conducted over 14 of these claims in 1970 (Assessment Work Files, Ontario Division of Mines).

M. Penziwol has 15 claims in the west-central part of Duckworth Township and has done extensive trenching on claims 131632 and 131686 (Assessment Work Files, Ontario Division of Mines).

K. Hackl holds 12 claims in Duckworth Township and has drilled one hole (135 feet) on the group (Assessment Work Files, Ontario Division of Mines).

Monpre Iron Mines Limited holds 64 patented and 6 unpatented claims in the eastern half of Duckworth Township. From 1956 to 1964, the company carried out geological and geophysical surveys and did extensive diamond drilling (41 holes, 23,940 feet) on the Matawin Iron Range (Shklanka 1968, p.376).

GENERAL GEOLOGY: The map-area is underlain by part of an extensive belt of Precambrian metavolcanic-metasedimentary rocks that extends from Thunder Bay to the western boundary of the District of Thunder Bay. This belt is bounded on the north by the Kashabowie Group of sedimentary rocks (Hodgkinson 1968) and on the south by felsic intrusive rocks.

The bulk of the metavolcanic rocks in the belt are of mafic to intermediate composition (basalt to andesite) and these are exposed both north and south of a central core of metasediments and felsic to intermediate metavolcanics. The mafic metavolcanics consist of massive, pillowed, porphyritic, and amygdaloidal flows, amphibolites, and minor amounts of tuffs and tuff-breccias.

The felsic to intermediate metavolcanics lie mainly in Duckworth Township south of the Gold Creek area, and trend east-west. They pinch out at the southwestern corner of Peewatai Lake and widen out going eastwards. These metavolcanics consist of massive flows, laminated flows, tuffs, crystal tuffs, and tuff-breccias, the latter three being the most abundant. In many places, some of the felsic tuffs show evidence of transportation, lamination, and gradation, and are interbedded with the metasediments. These tuffs have been grouped with the metasediments.

The metasedimentary rocks of the belt trend northeasterly from the northwestern corner of Dakota Lake to Maria Lake. North of Maria Lake, the metasediments are displaced by the Crayfish Creek Fault and intruded by the Peewatai Lake granitic stock. The metasediments in Duckworth Township trend easterly and are mainly north of the Gold Creek area. They consist of

conglomerate, greywacke, arkose, stratified tuff, argillite, graphic argillite, and iron formation.

Mafic intrusions occur as small sills and irregular bodies within the belt and comprise diorite, gabbro, anorthositic gabbro, and porphyritic basalt. Four, narrow, concordant, ultramafic lenses (intrusions or flows?) were noted within the mafic metavolcanics in Lamport Township. These peridotites are medium to fine grained, magnetic, and black to greenish black in colour.

A stock of porphyritic hornblende quartz monzonite occupies the area north of Peewatai Lake. A granitic body of batholithic size, with a migmatitic marginal zone, intrudes the southern part of the metavolcanic-metasedimentary belt. A feldspar porphyry stock (high level intrusion) is noted in the western part of Duckworth Township, just north of Gold Creek.

STRUCTURAL GEOLOGY: The metavolcanic-metasedimentary belt in the map-area appears to be on the southern limb of a large easterly trending anticline that plunges eastward at a moderate angle. Its axis is probably located to the north of the map-area. Evidence for the fold is based on top determinations from pillow lavas.

Three major faults have been recognized. The Tinto Lake Fault trends northeast and passes west of Tinto, Dakota, and Maria Lakes. The Crayfish Creek Fault trends east-southeast and passes through the northeastern part of Lamport Township and the northern part of Duckworth Township. The third fault trends northeast from just north of the eastern end of Kekekuab Lake to north-central part of Duckworth Township.

ECONOMIC GEOLOGY:

Iron: Iron formation has been found throughout the map-area intercalated with the mafic metavolcanics and the metasediments. The thickest and most extensive unit occurs in the eastern half of Duckworth Township and is the western extension of the Matawin Iron Range. Monpre Mining Company Limited has outlined a zone that is 10,275 feet long and 50 to 433 feet wide (averaging 217 feet). This zone has been estimated to contain 120 million tons grading 29.56 percent iron (Shklanka 1968, p.376).

Gold: The known gold occurrences in Duckworth Township are found in quartz veins in the feldspar porphyry stock in the northwestern part of the township. Minor amounts of pyrite, galena, and chalcopyrite occur in some of the veins.

Sulphide Minerals: Disseminated chalcopyrite, pyrrhotite, and pyrite occur in a breccia zone in felsic metavolcanics at the southeastern corner of the lake that is near the eastern border of Lamport Township and 1 mile north of Gold Creek. This zone is approximately 2 feet wide and strikes S75E.

Disseminated malachite and pyrrhotite in metasediments was noted in a trench at the southwestern corner of the small lake located near the east border of Lamport Township and 3/4 mile south of Gold Creek.

Sand and Gravel: The International Nickel Company of Canada, Limited has eight quarry permits in the northern part of Lamport Township for the extraction of sand and gravel.

Suggestions to Prospectors: A previously undetected lenticular body of peridotite was noted 2,500 feet north of the mouth of the northern bay of Kekekuab Lake in Lamport Township. This lens is about 9,000 feet long and 800 feet thick at its centre. It should be prospected for base metals.

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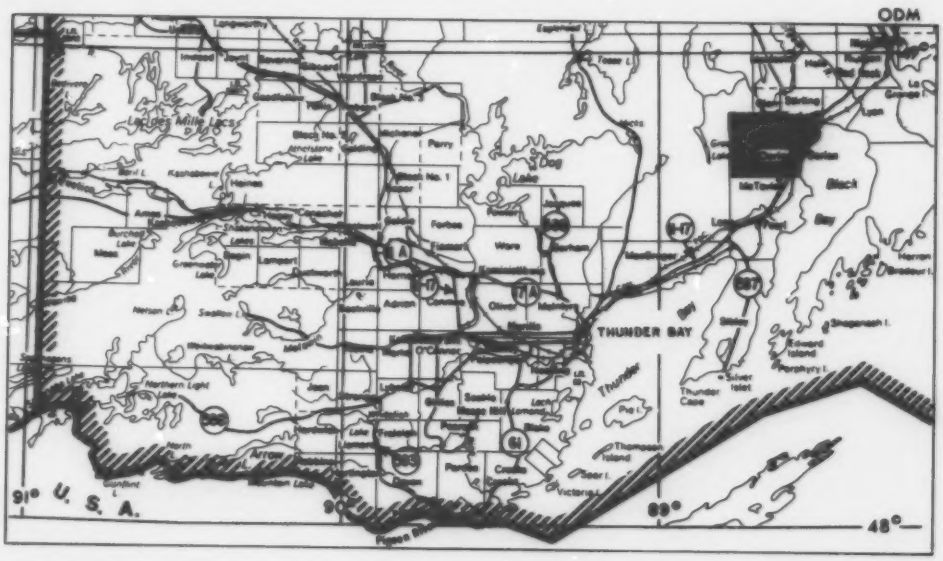
No.12 THE DORION-WOLF LAKE AREA

DISTRICT OF THUNDER BAY

by

W.H. McIlwaine[1] and L.A. Tihor[2]

LOCATION: The Dorion-Wolf Lake area comprises Dorion Township and an adjacent area to the north and is about 45 miles northeast of Thunder Bay. Access is from Highway 11-17 and numerous all-weather branch roads and lesser quality logging roads.



LOCATION MAP

Scale: 1 inch to 25 miles

MINERAL EXPLORATION: Exploration in the latter part of the nineteenth century was concentrated on the search for lead-zinc deposits associated with the non-conformity between the Early Precambrian granitic rocks and the Late Precambrian Sibley Group. Several prospects, including the Dorion, the Bishop, and the Thunder Bay, were developed by exploration shafts along this non-conformity between Cavern and Wolf Lakes. More recently a similar type of occurrence north of Innes Lake has been examined by Santack Mines Limited. Stripping, trenching, and 8 diamond drill holes totalling 1,392 feet were put down during 1970 and 1971 (Assessment Work Files, Ontario Division of Mines).

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[2]Student, Geology Department, Lakehead University, Thunder Bay.

GENERAL GEOLOGY: The bedrock in the area ranges from Early to Late Precambrian. An easterly trending Early Precambrian (Archean) migmatite belt underlies most of the Innes Lake and Wolf Lake areas; compositions vary from gneissic metasedimentary rocks to nebulitic, almost massive, granitoid rocks. The grade of regional metamorphism is in the almandine-amphibolite facies.

The extreme eastern end of a 2-mile wide Early Precambrian metavolcanic-metasedimentary belt underlies southwestern Dorion Township. The southern 75 percent of the belt is composed of pyroclastic metavolcanic rocks that are mainly mafic to intermediate in composition but which grade to a more felsic composition northwards; local narrow intercalations of metagreywacke and metasiltstone occur. To the north, and apparently overlying the meta-volcanic rocks, is a 1/2-mile wide belt of meta-argillite with local intercalated metagreywacke.

The older rocks are intruded by a massive fine-grained leucocratic quartz monzonite that is predominantly a biotite-bearing rock with local muscovite; the biotite has locally been altered to chlorite.

Middle Precambrian rocks are represented by one outcrop of black, hematitic argillite in contact with diabase on the shore of Lake Superior at Dorion Landing; this has been assigned to the Gunflint Formation.

Late Precambrian, Sibley Group sedimentary rocks, underlie much of the eastern and northwestern parts of the map-area. Here, as in McTavish Township (see No.13 description, this volume), two formational units can be defined. Basal conglomerate and fine- to medium-grained buff sandstone underlie the western part of the area. This is overlain to the east by fine-grained red sandstones and red, grey, and green limey mudstones. Thickness determinations are hindered by poor exposure.

All of the aforementioned rocks have been intruded by medium-grained diabase. In the flat-lying sedimentary rocks the diabase forms sills whereas in the Early Precambrian rocks it occurs as dikes and irregular shaped 'collars' around topographically higher areas of the intruded rocks. Apophyses of narrow, short, irregular diabase dikes are common in the granitoid rocks within about 20 feet of the diabase granite contact.

STRUCTURAL GEOLOGY: The migmatites are characterized by extensive flow folding but evidence also exists for two further stages of folding in the migmatites, one of which is similar to the fold pattern in the greenstone belt. In the greenstone belt a pronounced, penetrative, axial plane cleavage is associated with isoclinal folding which has produced a major anticline plunging 25 degrees in a N80E direction. Parasitic folding consists of 'Z' folds across the belt except in the extreme south where the drag folds were 'S' shaped. Top determinations in the northern belt of metasedimentary rocks indicated a north-facing sequence.

Shear zones marked by brecciation, silicification, schisting, and pronounced topographical lineaments are common in the Early Precambrian rocks. However, they showed no common orientation and no obvious

dislocation was found along any of them. The Furcate Lake Fault traverses the entire map-area in a north-south direction and is indicated by a strong lineament as well as by much brecciation and silicification. In many locations along the length of the fault outcrops can be found of a diabase dike which occupies the fault and is itself brecciated and silicified.

ECONOMIC GEOLOGY: The lead-zinc mineralization is similar to that found in McTavish Township. Quartz-carbonate veins mineralized with galena, sphalerite, and pyrite are associated with Sibley Group-Early Precambrian (Archean) non-conformity. Franklin (1970) suggested that the mineralization is the result of precipitation from circulating ground waters along the nonconformity.

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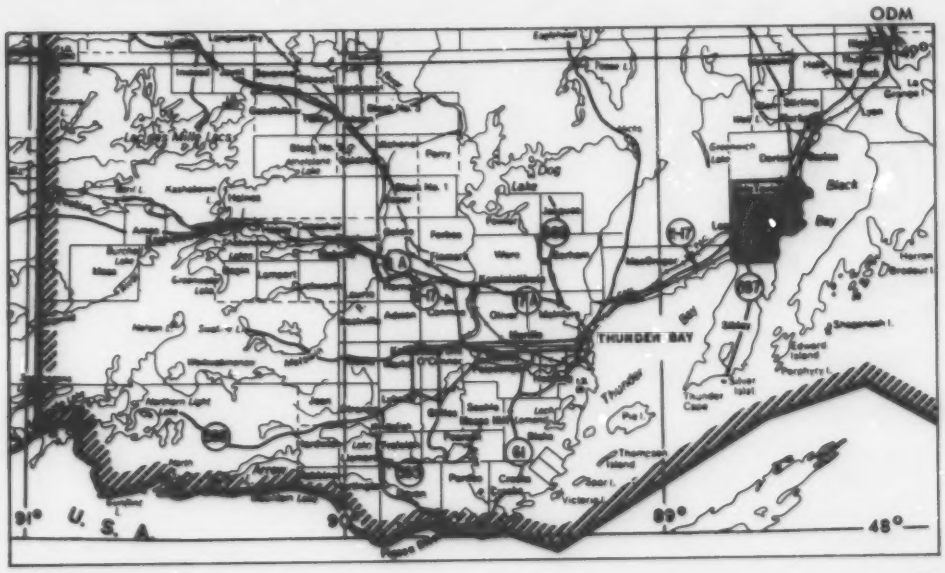
No.13 SOUTH HALF OF McTAVISH TOWNSHIP

DISTRICT OF THUNDER BAY

by

W.H. McIlwaine[1]

LOCATION: McTavish Township is about 35 miles northeast of Thunder Bay. Good access is provided by Highway 11-17 and Highway 587; numerous branch roads and trails are present.



LOCATION MAP

Scale: 1 inch to 25 miles

MINERAL EXPLORATION: Exploration in the area has been confined to an easterly trending brecciated zone along and close to the south shore of Sheen (Silver) Lake. The work, consisting of numerous test pits and trenches, was done mainly in the latter part of the nineteenth century in the search for lead- and zinc-bearing quartz-carbonate veins. These veins are common elsewhere in the map-area (McIlwaine 1971a,b) and have been described in detail by Franklin (1970). More recent work in this area includes 8 diamond drill holes totalling 2,964 feet put down by Little Long Lac Gold Mines Limited in 1947 (Resident Geologist's Files, Thunder Bay).

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GENERAL GEOLOGY: Bedrock in the area ranges from Early to Late Precambrian. Early Precambrian (Archean) rocks are confined to a small area adjacent to Loon Lake. South of the lake the eastern end of a metavolcanic-metasedimentary sequence is exposed with lithostratigraphic relationships indicating apparent north-facing succession. Mafic metavolcanics and intercalated metagreywackes are overlain to the north by brecciated felsic metavolcanic rocks. North of Loon Lake is a small area of biotite schist, of probable sedimentary origin; these rocks continue to the northeast into the northern half of the township (McIlwaine 1971a). Immediately to the west the biotite schist has been intruded by biotite-bearing leuco-quartz monzonite.

Middle Precambrian rocks are represented by the Gunflint and Rove Formations. The stratigraphy of the Gunflint Formation has been documented by Goodwin (1956) and the results of mapping the formation in McTavish Township were described by Moorhouse (1960). Both the lower and upper members are present in the extreme western part of the township. Rock types include chert, carbonate, taconite, shale, greywacke, and algal chert. Limited exposure of the Rove Formation indicates a crumbly black shale as the main lithology.

The Late Precambrian Sibley Group rocks underlie the greatest part of the area. Two main lithostratigraphic units are defined. The lower is composed of a basal lenticular conglomerate overlain by 180 feet of buff quartzose sandstone with local, 6 feet thick, red sandstone and mudstone beds. This section is well exposed along the Canadian National Railways tracks at and east of Pass Lake. Overlying the sandstone is red sandstone and mudstone with intraformational breccias and conglomerates common in the lower part. Owing to chaotic bedding attitudes thickness of this unit in the map-area is difficult to determine.

Diabase sheets and dikes are the youngest Precambrian rocks in the area.

STRUCTURAL GEOLOGY: Foliation in the Early Precambrian rocks is steeply dipping and strikes northeasterly, whereas bedding in the Middle and Late Precambrian sedimentary rocks has gentle dips. Easterly trending faults are the most common and they occur throughout the area.

ECONOMIC GEOLOGY: Two lead- and zinc-bearing vein systems along the south shore of Sheen Lake were described by Hawley (1929, p.80,81). The veins are in or adjacent to a breccia zone and are up to 2 feet wide. The vein material is quartz-carbonate rock, with galena, sphalerite, and pyrite the main sulphide minerals (Franklin 1970). Drilling by Little Long Lac Gold Mines Limited indicated 'values' up to 8.1 percent lead and 6.7 percent zinc (Resident Geologist's Files, Thunder Bay).

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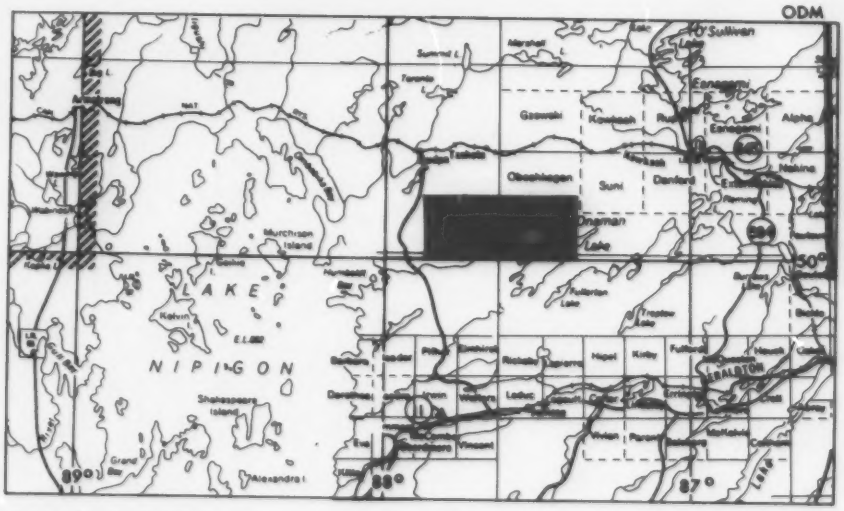
No.14 NORTH ONAMAN LAKE AREA

DISTRICT OF THUNDER BAY

by

P.C. Thurston[1]

LOCATION: The North Onaman Lake map-area is bounded by Latitudes 50°00' and 50°07'30"N and by Longitudes 87°22'30" and 87°52'30"W, and comprises 194 square miles, of which 145 were mapped during the field season. The area



LOCATION MAP

Scale: 1 inch to 25 miles

lies north of Jellicoe and is reached by travelling 32 miles north from Highway 11 on Highway 801 and the Auden Road, a private road owned by Abitibi Power and Paper Company, to the Tashota Mines Road and thence eastward about 12 miles. Access to large parts of the area is via the North and South Onaman Rivers. The remainder of the area is accessible by float-equipped aircraft from Jellicoe or Nakina.

MINERAL EXPLORATION: Early mapping in the area included P.E. Hopkins (1917), E.S. Moore (1909), T.L. Gledhill (1925), and W.W. Moorhouse (1938). Early prospecting activity in the general area mentioned by Moore (1909, p.198) was in search of iron and did not result in any staking.

In 1925, the Canada Mines Syndicate did extensive trenching, amounting to 1,600 feet, and channel sampling on two claims. Interest was in gold and

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silver, although galena, sphalerite, and chalcopyrite were noted at the time. Other properties active at this time included the Currie find, and the Johnson find (Gledhill 1925, p.83).

Visible gold was discovered by J. McKechnie in August 1923 on claim KK524. The property was optioned in 1924 to the Nipissing Mining Company. Tashota Gold Mines Limited, formed in 1927, carried out development work, but ceased activity in 1929. In 1934, operations were resumed by Tashota Goldfields Limited with Minefinders Limited having interest in the company (Moorhouse 1938, p.21). Development consisted of a shaft to the 325-foot level with levels also at 100 feet and 200 feet and a winze from the 325-foot level to the 625-foot level with a 475-foot level. The mine was equipped with a 70-ton per day mill that achieved a total production over the interval 1934-1938 of: 12,355.7 ounces of Au, 14,527 ounces of Ag, and 507,770 pounds of copper (ODM Statistical Files, 1935-1939). Operations ceased in September 1937.

The mine was dewatered in 1967, geological mapping underground and on surface and ground magnetometer surveys were carried out. In addition 4,004 feet of diamond drilling were carried out at this time (Northern Miner Handbook 1968, p.325). Since then the property has been idle.

Exploration activity in the early 1950s resulted in the staking of large parts of the map-area. The interest centered on the properties of Headvue Mines Limited and Coulee Lead and Zinc Mines Limited. Headvue Mines completed an EM survey, a ground magnetic survey, and 30,000 feet of diamond drilling on their property and a claim group optioned from Headway Red Lake Gold Mines Limited (Assessment Work Files, Ontario Division of Mines, Thunder Bay). The properties of Headway Red Lake Gold Mines Limited and Coulee Lead and Zinc Mines Limited were optioned by Noranda Exploration Limited in June 1971. Various geophysical surveys and 1,928 feet of diamond drilling were carried out in 1971 and early 1972. Further work involving geochemical sampling and geological mapping continued this field season. In addition about 100 claims have been staked to the north and west.

GENERAL GEOLOGY: Keewatin-type, mafic and intermediate to felsic metavolcanic rocks with minor intercalations of graphitic metasediments underlie the central part of the area. These rocks form a belt extending from the North Onaman River, 1.5 miles downstream from Onaman Lake, southwestward to the western border of the area mapped this field season (Longitude 87°45'). The volcanic belt is a maximum of 2.75 miles wide within the map-area. The remainder of the area is underlain by granitic and migmatitic rocks. All these rocks are intruded by northeast-trending diabase dikes.

The mafic metavolcanic rocks consist of massive to foliated flows in which pillowed and porphyritic zones are common. Pyroclastic rocks with an intermediate to mafic matrix and rhyolitic clasts are found in the area north and northwest of MacDonald Lake-

The intermediate to felsic metavolcanic rocks occur as somewhat rare intercalations, a few feet thick, in the predominantly mafic metavolcanic sequence and as a lens up to 1.25 miles long and 1,800 feet wide south of the

North Onaman River in the MacDonald Lake area. The rock types include crystal tuff, lithic tuff, rhyolite, amphibole-sericite schist, and a rhyolitic quartz porphyry. Numerous quartz-feldspar porphyry dikes cut the mafic metavolcanics.

A metagabbro sill, about 200 feet thick, parallels the felsic volcanic lens in the MacDonald Lake area over a distance of 1-3/4 miles. A lens of metagabbro, about 1 mile long but open to the north, lies south of Barn Lake. The lens strikes in a northeasterly direction, is up to 3,000 feet wide, and is very coarse grained in the central part.

Oxide, sulphide, and silicate facies iron formation is found in the area but continuity is difficult to establish, given the sparse, discontinuous nature of the outcrop. The major occurrence in the vicinity of the Tashota Mine has been mapped previously (Flaherty 1936, p.730).

The belt is bordered on the north and south by granitic rocks of quartz monzonite to trondhjemite composition with biotite as the principal mafic mineral. In the Onaman Lake area metasedimentary migmatites are predominant but the north end of the lake is underlain by a hornblende granodiorite pluton.

STRUCTURAL GEOLOGY: The metavolcanic belt has been isoclinally folded about steep westerly-plunging axes. Top determinations, based on grain gradations in tuffaceous rocks, and pillow top determinations, suggest that a synclinal axis passes through the felsic volcanic rocks south of MacDonald Lake. Where more detailed mapping has been carried out, in the vicinity of Tashota Mine, it has been established that minor folds exist and that possibly several episodes of folding have occurred. Shearing and minor scale faulting is common throughout the area and some evidence of strike faults is present in the metavolcanics, e.g. granulation of the rocks and emplacement of late sulphide mineralization.

Metamorphic rank of the rocks in the central part of the metavolcanic belt is lower to middle greenschist facies, but rocks at the margins of the belt and the metasedimentary migmatites are probably almandine-amphibolite facies.

Late movement (i.e. post-granite emplacement) is indicated in the area by brecciated, pseudotachylite filled joints in the granitic rocks west of Jenkins Lake.

ECONOMIC GEOLOGY: The Tashota Mine is the only property in the map-area for which any production has been recorded. Gold occurs in quartz veins and closely associated chloritic zones in mafic metavolcanic rocks. The gold is associated with disseminations of chalcopyrite and pyrrhotite in brecciated quartz veins, and in the chloritic zones with up to 10 percent disseminated sulphide minerals. Chalcopyrite, pyrite, pyrrhotite occur with minor bismuthinite and argentite (Kindle 1931, p.92). Analyses of up to 2.61 percent Cu were obtained on material from the mine dump (Analyses by Mineral Research Branch, Ontario Division of Mines). There appears to be some

relationship between the ore zones and bodies of quartz, feldspar, and quartz-feldspar porphyry, which are concordant with the surrounding metavolcanic stratigraphy (Flaherty 1936; Moorhouse 1938, p.21).

Disseminated sulphide minerals occur scattered locally throughout the metavolcanic rocks of the belt. Disseminated and massive sulphide minerals, including pyrite, pyrrhotite, and chalcopyrite, occur in zones associated with felsic pyroclastic rocks in the MacDonald Lake area and west of the Tashota Mine on the old Headway Red Lake Mines Limited property. West of the Tashota Mine the sulphide minerals occur along a shear zone in felsic pyroclastic rocks. Most of the recent drilling by Noranda Exploration Limited has been of geophysical anomalies associated with massive sulphide or sulphide and graphite horizons in the felsic metavolcanics to the south and east of the zone originally drilled by Headway Red Lake Gold Mines Limited.

Disseminated pyrrhotite in massive mafic metavolcanics occurs in several areas north of the South Onaman River. Where the rock is at all fractured, chalcopyrite is found on joint surfaces. Analyses have indicated trace amounts of copper (Analyses by the Mineral Research Branch, Ontario Division of Mines).

Small amounts of galena, and chalcopyrite have been found as disseminated grains constituting up to 7 percent of the rock in medium-grained massive to poorly foliated biotite quartz monzonite south of the mine and about 1.5 miles west of the mine. The analyses indicated 0.11 percent Cu and 0.16 percent Zn (Mineral Research Branch, Ontario Division of Mines). The sulphide minerals appear to be related to a late fracture system in the granitic rocks.

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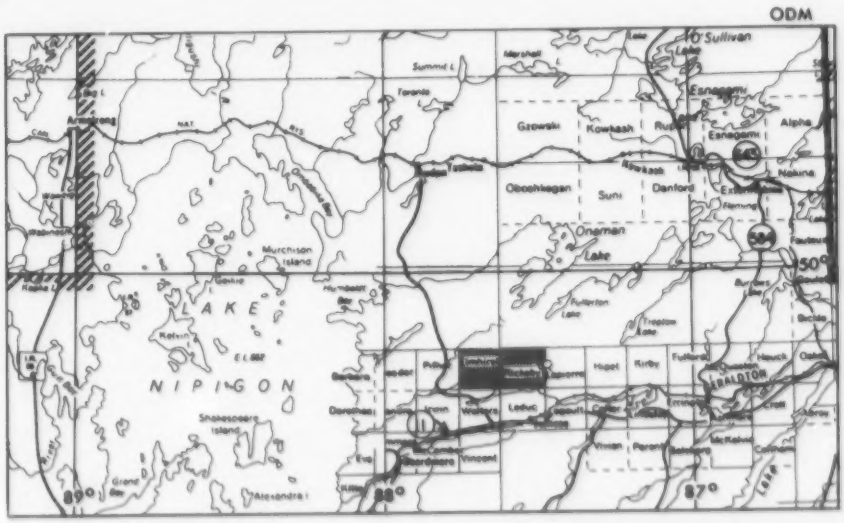
No.15 ELMHIRST AND RICKABY TOWNSHIPS

DISTRICT OF THUNDER BAY

by

W.O. Mackasey[1] and Henry Wallace[2]

LOCATION: Elmhirst and Rickaby Townships are located north of Jellicoe, which is approximately 140 miles northeast of the City of Thunder Bay, and form part of the 'Sturgeon River Gold Belt'.



LOCATION MAP

Scale: 1 inch to 25 miles

Highway 11, which forms the Northern Route of the Trans-Canada Highway, a line of the Canadian National Railways, and the natural gas pipeline of TransCanada Pipe Lines Limited pass through the adjoining townships to the south of the map-area. A 3,000-foot, compacted gravel airstrip is located at Jellicoe.

Access is provided by Highway 801 and a network of bush roads, which provide excellent coverage within the two townships.

MINERAL EXPLORATION: Exploration for gold has been active in the Beardmore-Geraldton region since the mid-1920s. The first gold discovery within the map-area was made in 1931 by T.W. Johnson on the north shore of Atigogama

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[2]Graduate Student, University of Toronto, Toronto.

Lake. This property, subsequently named the Orphan Mine, was in production from 1934 to 1935 and produced 2,460 ounces of gold and 1,558 ounces of silver valued at $86,756 (Statistical Files, Ontario Division of Mines, Toronto). The Sturgeon River Gold Mine, some 2,000 feet beyond the southwestern corner of Elmhirst Township was discovered in 1934 and operated from 1937 to 1942, producing 73,438 ounces of gold and 15,922 ounces of silver worth $2,728,905 (Statistical Files, Ontario Division of Mines, Toronto). Several other gold prospects were discovered in the map-area during the 1934-1935 staking rush (Bruce 1937).

The first base metal find was made in the northwestern corner of Elmhirst Township in 1947 at the present Jacobus Mining Corporation Limited property. Work on this property, including extensive diamond drilling, has proceeded on several occasions since 1947, and to date a total of 940,000 tons of 0.42 percent Cu and 0.41 percent Ni has been outlined (Wheadon 1971a).

Interest in Cu-Zn mineralization related to metavolcanic rocks in the map-area increased with the discoveries, in Rickaby Township, of the Kenty and Martin prospects in 1950 and 1952 respectively. Since that time the central part of Rickaby Township has been actively explored for base metals. In 1959, a copper showing was discovered on the Namewaminikan (Sturgeon) River about 1/4 mile west of Barnum Green Rapids on what is now the property of Carling Copper Mines Limited. This area has also been continuously investigated for base metals up to the present.

In the last two years several exploration companies have worked in the map-area. A molybdenite discovery by August Mitto in 1971 has been trenched and drilled by Chemalloy Minerals Limited. Phelps Dodge Corporation of Canada Limited undertook geological and geophysical surveys in the fall of 1971 in the vicinity of the Kenty showing, Rickaby Township. Fourteen diamond drill holes have been completed since that time. Chesterville Mines Limited carried out geological mapping and diamond drilling on the Jacobus Cu-Ni occurrence in the fall and winter of 1971-1972. In the southwestern corner of Elmhirst Township, Carling Copper Mines Limited and The Coniagas Mines Limited have both been active in the past field season. The Coniagas Mines Limited property is being prospected for gold and base metals. Carling Copper Mines Limited have undertaken geological, geophysical, trenching, and diamond drill programs in the past year to investigate the gold, copper, and zinc potential of their property. Several other mining companies and individuals including Cominco Limited and Lynx-Canada Explorations Limited hold ground within the map-area.

GENERAL GEOLOGY: Intermediate to felsic, and mafic Keewatin-type metavolcanics are the oldest rocks in the map-area. These are intruded by granitic to dioritic stocks that underlie the northeastern part of Rickaby Township and most of Elmhirst Township. The metavolcanics and plutonic rocks are cut by a variety of minor intrusions of probable Archean age, the largest being sill-like gabbro bodies in Elmhirst Township. Narrow dikes ranging from mafic to felsic in composition are found throughout the map-area. North-striking Keweenawan diabase dikes cut all the Archean-type rocks.

Most of the intermediate to felsic metavolcanics in the map-area are of pyroclastic origin, and are predominantly of dacitic to andesitic composition.

Tuff breccia and lapilli-tuff are abundant. Massive and amygdaloidal flows are also present. Rhyolite and rhyodacite occur intercalated with the more mafic rock types and form a relatively narrow belt diagonally transecting the two townships.

Most of the mafic metavolcanics are massive flows of andesitic to basaltic composition. Pillow lava, flow breccia, agglomerate, and amygdaloidal lava are common. A belt of well-foliated chlorite schist, derived from mafic lava, occurs along the southern boundary of Rickaby Township.

The contact between the intermediate to felsic lavas and the predominantly mafic metavolcanic succession to the south, trends northeast from Expansion Lake to the west side of Atigogama Lake.

STRUCTURAL GEOLOGY: On a regional scale the metavolcanics in the map-area form the southern limb of a broad east-west fold extending from Lake Nipigon to Hipel Township, east of the map-area. The nose of the structure lies in Lapierre Township and the northern limb extends towards the Conglomerate Lake-Onaman River area. The mafic volcanic core of the fold is situated in Pifher Township and is overlain by a succession of pyroclastic rocks that extends into the present map-area. These in turn, are apparently overlain by a second sequence of mafic volcanics in the southeastern part of Rickaby Township. This structure is generally interpreted to be anticlinal.

The schistosity of the metavolcanics varies in strike from east to northeast and generally parallels primary depositional structures.

Major lineaments in the map-area are east-northeast- to northeast-trending, and most are interpreted to be related to faulting.

ECONOMIC GEOLOGY: Gold, silver, molybdenum, copper, zinc, nickel, lead, and sand and gravel are present within the map-area.

Gold: All of the many gold occurrences in the map-area are associated with shear zones and(or) quartz veins that commonly have significant sulphide mineral contents. The quartz vein systems in the Coniagas Mines Limited property, which were first explored for gold, contain abundant sphalerite. Nearly all of the present showings occur where the host rock is metavolcanic, as opposed to plutonic, in origin. At the Orphan Mine, where the gold-bearing veins cut both volcanic and plutonic rock, Bruce (1937, p.53) stated that "... values are higher and more consistent where wall rock is lava".

Appreciable gold and silver 'values' have been reported from the Coniagas Mines Limited, Carling Copper Mines Limited, and Kenty sulphide mineral showings.

Sulphide Minerals: Occurrences of disseminated sulphide mineralization are widespread in the intermediate to felsic metavolcanics of the map-area. Pyrite and pyrrhotite are very common, as are minor amounts of chalcopyrite and sphalerite.

In the Coniagas Mines Limited and Carling Copper Mines Limited properties the base metal sulphides consist of sphalerite and chalcopyrite with minor

galena. Mineralization in this area appears to be related to east-northeast-trending shear and fracture zones in rhyolitic to dacitic rocks.

In the area northeast of Seven-Foot Falls, in Rickaby Township, including the Martin and Kenty prospects, sulphide mineralization is predominantly chalcopyrite-pyrite having a markedly lower sphalerite content then the occurrences in southwestern Elmhirst Township. The mineralization is associated with, and possibly stratigraphically related to, east-trending felsic flows, some of which are spherulitic rhyolites. In the immediate vicinity of these showings rhyolite and rhyodacite flows and breccias alternate with units more intermediate in composition.

The great majority of sulphide showings in these two townships occur in a relatively narrow belt of intermediate to felsic metavolcanics about 1 mile wide, extending from the Coniagas Mines Limited and Carling Copper Mines Limited properties in southwestern Elmhirst Township, through the Douglas showing 1 mile southwest of Seven-Foot Falls, the Kenty and Martin prospects in central Rickaby Townships, to the northwest side of Atigogama Lake. This belt should be prospected to the north and east of Atigogama Lake.

The gabbroic body underlying the Jacobus Mining Corporation property in northwestern Elmhirst Township forms a sill that appears to have been cut off to the east by a fault. The mineralization consists of disseminated pyrrhotite, pyrite, chalcopyrite, and pentlandite having a Ni:Cu ratio approximately equal to one.

The Chemalloy Minerals Limited molybdenum showing in northern Elmhirst Township occurs in quartz veins and sheared granodiorite. The molybdenite is present as an extremely fine dispersion imparting a blue-grey colour to the quartz. In one of the test holes an average of 0.10 percent MoS_2 over a drill width of 20 feet was intersected between 23 and 41 feet below collar. The highest analysis reported is 0.20 percent MoS_2 for a 5-foot drill width. Here the molybdenite occurs in sheared granodiorite containing up to 50 percent quartz (Wheadon 1971b). The possibility of other molybdenite occurrences, along with copper and(or) gold, being associated with the more felsic plutonic rocks in the area should be considered.

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During the field season an occurrence of vanadium-bearing titaniferous iron formation north of the map-area was examined by the field party. This occurrence, which is within an east-trending metasedimentary belt, is located 4 miles north of the mouth of the Onaman River, at approximately 88°00'W Longitude and 49°59'N Latitude, on a group of claims (TB335142-TB335147, TB288478-TB288483) held by L.A. Clarke and currently being worked by J. Zmudzinski. The exposure examined is 8 feet wide with a strike length of approximately 80 feet and is composed of east-striking steeply dipping medium-grained magnetite iron formation in sharp contact with fine-grained metasediments to the north. The southern contact is not exposed, but a decrease in magnetite content south across the exposure was observed.

The field party collected a chip sample across a width of 4 feet near the central part of the exposure. This was analyzed and found to contain 0.77

percent V_2O_5[1]. A grab sample collected from within 6 inches of the northern contact contained 0.45 percent V_2O_5[1], whereas a grab sample from the leaner iron formation on the southern margin of the exposure contained 0.27 percent V_2O_5[1].

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[1]Analyses by the Mineral Research Branch, Ontario Division of Mines.

No.16 EAST QUETICO BELT GRAVITY SURVEY

DISTRICTS OF ALGOMA, COCHRANE, AND THUNDER BAY

by

Wooil Moon[1]

LOCATION: The survey area comprises Lake Nipigon and the area bounded by Lake Nipigon-Longlac-Hornepayne-Wawa and the north shore of Lake Superior. The area covers about 22,000-square miles and is bounded by Latitudes 48°15' and 50°15N and Longitudes 84°30' and 89°00'W.

GRAVITY CONTROL STATIONS: Gravity control stations were established at about 60 locations and these control stations are tied to the primary gravity control stations established by the Earth Physics Branch of the Department of Energy, Mines and Resources, Ottawa. The leap-frog and closed ladder procedure was taken in the establishment of these control stations. The gravimeter used was No.294 Geodetic model gravimeter manufactured by LaCoste-Romberg Incorporated. Most of these control stations have exact elevations secured by bench marks of the Geodetic Survey of Canada or the Ontario Ministry of Transportation and Communication. Elevations of a few control stations in the remote parts of the area were determined by Paulin Micro Altimeters (No.3290 and No.3311). These two Paulin Micro Altimeters were calibrated prior to the field season by the Division of Mechanical Engineering, National Research Council. Elevations of the control stations on Lake Nipigon were determined relative to the lake water level. These control stations established in the early part of the summer were all rechecked at the end of the summer field season. The data on each gravity control station will be published in a format similar to the magnetic control station report (Moon 1972; Middleton 1972). Data for each station will include a preliminary gravity value, elevation, Bouguer anomaly, latitude and longitude, schematic map of the location, short description of location, photograph of station, station name and station number.

REGIONAL GRAVITY SURVEY: After the control stations were established, about 1,500 gravity measurements were made in the survey area with station intervals of 5 to 10 miles in areas of better accessibility. In remote areas the station spacing was increased up to 30 miles. Two gravimeters, LaCoste-Romberg No.294 and Scintrex gravimeter No.293 were used for gravity measurements in all closed loop surveys. The elevations of the stations were controlled by two Paulin Micro Altimeters (No.3290 and No.3311). The average maximum daily closure errors were 0.1 mgal and 0.4 mgal for LaCoste-Romberg No.294 and Scintrex No.293 respectively. The drift of LaCoste-Romberg No.294 was determined by repeated gravity measurements at the Nipigon post office control station. The drift curve was obtained as a function of time as well

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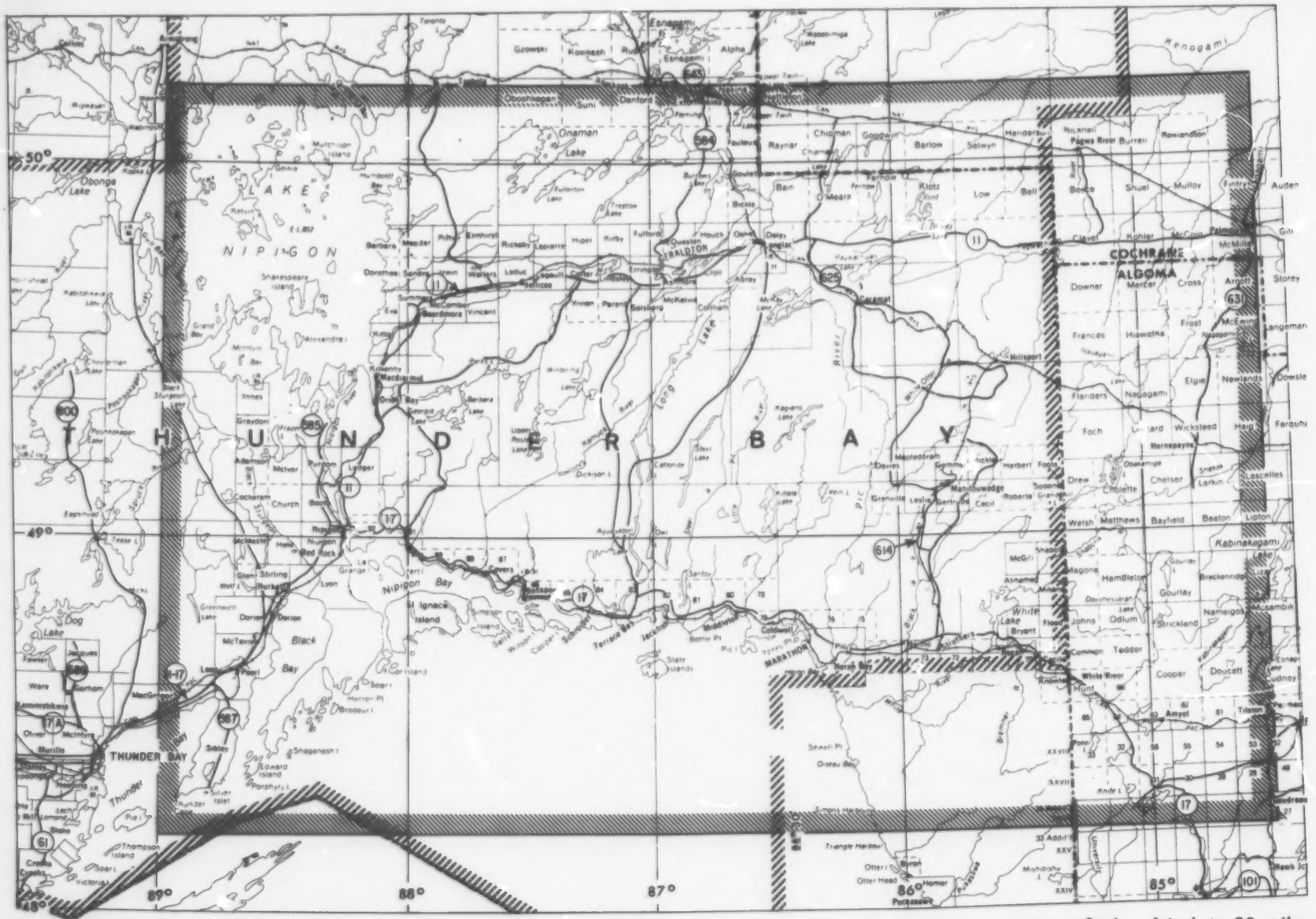

LOCATION MAP

Scale: 1 inch to 25 miles

as a function of the number of observations taken. For determination of the earth tide effect, a continuous gravity measurement was taken in the Beardmore base camp for 48 hours at 1-hour intervals. These results will be incorporated in the final data reduction.

About 100 rock samples were taken (representing all major rock types in the area) for specific gravity measurements, which will be needed in the quantitative interpretation of the final Bouguer anomaly map of the area.

GEOLOGICAL INTERPRETATION: This regional gravity survey will be useful in the study of: a) the physical nature of the Nipigon diabase sill and its source area; b) the relation of the Beardmore-Geraldton metavolcanic-metasedimentary belt to a similar metavolcanic-metasedimentary sequence on the north shore of Lake Superior; c) crustal thickness and the tectonic nature of the area between Highway 11 and Highway 17; d) structural trends and lines, for example faults along Long Lake (Gravel River Fault); and e) the crustal depression of the Nipigon-Lake Nipigon area during the Proterozoic period of Precambrian time.

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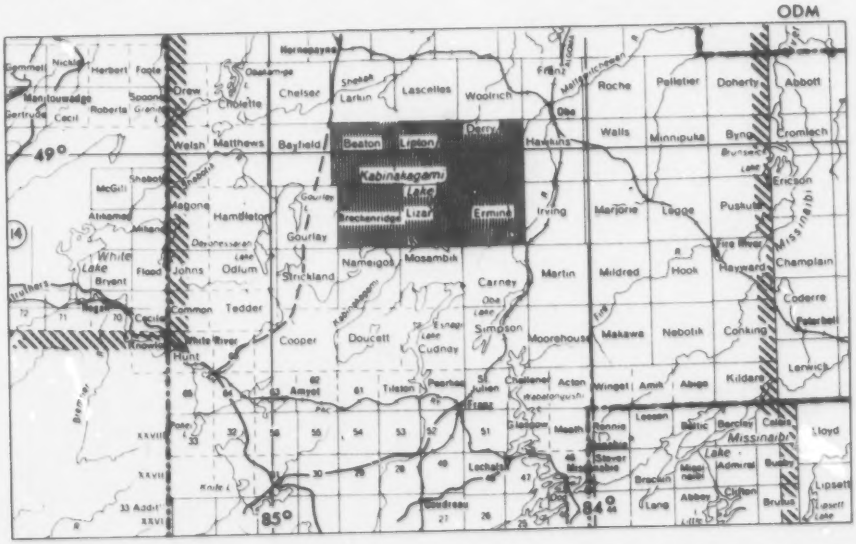
No.17 KABINAKAGAMI LAKE AREA

DISTRICT OF ALGOMA

by

G.M. Siragusa[1]

LOCATION: The map-area is bounded by Latitudes 48°47' and 49°03'N, and by Longitudes 84°13' and 84°48'W. It includes the six contiguous townships of Beaton, Lipton, Derry, Ermine, Lizar, and Breckenridge for a total of approximately 486-square miles. The eastern part of the area can be reached



LOCATION MAP

Scale: 1 inch to 25 miles

by float-equipped aircraft from White River, or from Oba via Oba River and Pine Portage. Highway 631 connects White River to Hornepayne and provides access to western Beaton Township.

Parts of the area were mapped by J.M. Maynard (1929), and by K.G. Fenwick (1964). The 1972 field work consisted of: a) lakeshore mapping and ground traverses at 1/2-mile intervals or less in volcanic terrain of known or assumed sufficient outcrop density; b) reconnaissance traverses in areas of little outcrop, but with density of contours showing geologically interesting pattern trends on Aeromagnetic Maps of the area; and c) helicopter reconnaissance runs at 1-1/2- to 2-mile intervals in areas of problematic access and where rocks other than granites were not expected to be present.

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MINERAL EXPLORATION: Mineral exploration in the metavolcanics of the map-area began probably in the late 1920s. Gold was found in Lizar Township in 1926 and several claims were staked in 1928 on the western shore of Kabinakagami Lake. Occurrences of chalcopyrite and galena in Berry, Lizar, and Ermine Townships, and of molybdenite in Derry Township were also reported by Maynard (1929, p.124,125). No development work followed the discovery of these sulphide mineral showings.

In the late thirties Hiawatha Gold Mines Limited carried out underground and surface exploration and development on a property consisting of 52 claims in Lizar Township. A shaft was sunk to a depth of 299 feet and levels were established at depths of 150 and 275 feet. On the first level 847 feet of drifting and 967 feet of crosscutting were completed; on the second level 2,547 feet of drifting, 1,750 feet of crosscutting, and 250 feet of raising were completed.

Underground and surface diamond drilling accounted for 3,474 and 13,034 feet, respectively. From 1937 to the end of 1939 the production was 179 ounces of gold and 31 ounces of silver (ODM, Mineral Deposits File, Lizar Township, Hiawatha Mine). The production ceased in 1939 presumably for reasons related to wartime conditions. In 1969 further exploration was undertaken by Primrock Mining and Exploration Limited on the property formerly held by Hiawatha Gold Mines Limited. This work consisted of dewatering and sampling of the mine workings and of some drilling aimed to test another gold occurrence in proximity of the old shaft.

Several gold-silver, lead-zinc, and copper-lead occurrences are found at various localities of western Lizar Township (Giblin 1968b). In most places development has consisted of stripping and trenching followed in a few areas by drilling of which no accurate record is available.

In 1954, an aeromagnetic survey carried out by Neoscope Explorations Limited outlined an anomaly on the peninsula to the east of Boot Bay, Lizar Township. The area was mapped and sampled by Black Bourgon Mines Limited in 1955, and six drill holes for a total of 2,998 feet were drilled by Sand River Gold Mining Company Limited in 1957. Mineralization consists of massive to semimassive magnetite in zones up to 3,000 feet long and 1,500 feet wide (ODM, Mineral Deposits File, Lizar Township, Kabinakagami Lake prospect). Chemical analysis of a bulk sample of the ore shows 45.6 percent Fe and chrome and titania contents of 2.03 percent and 5.6 percent respectively (Rupert 1972, p.102).

In the summer of 1972 no exploration work was, apparently, being done in the map-area.

GENERAL GEOLOGY: The eastern part of the map-area covers part of a volcano-sedimentary belt that extends beyond the eastern boundary of Derry Township and the southern boundary of Breckenridge Township. A northwest-trending lobe of this belt underlies parts of Derry Township where it attains maximum width of about 2.5 miles, south of Cameron Lake. This belt is moderately to poorly exposed and differs from the other belts in the map-area because of its

divergent structural trend and, possibly, because of the apparent absence of felsic volcanic interbeds found elsewhere within the mafic metavolcanics.

The main belt consists of a northeast-trending, predominantly metavolcanic, series extending and widening from southern Derry Township to southern Lizar and Breckenridge Townships. Widening is accompanied by a marked tendency of the volcanic terrain to form subparallel ridges delimited by steep slopes on all sides. In southern Lizar and Breckenridge Townships the belt is approximately 5 miles wide, about twice the width previously assumed by Maynard (1929). In south-central Derry Township the belt is exposed on a arcuate peninsula south of Pine Portage and at this locality it is about 1/2 mile wide. An easterly trending branch of the main belt underlies part of northern Ermine Township. Due to scarcity of exposures, this branch is poorly defined and probably is less than 2 miles wide.

The metavolcanic rocks are mostly foliated, are mafic to intermediate in composition, and were metamorphosed under greenschist to, probably, middle amphibolite facies conditions. Retrograde metamorphism has locally developed in association with shearing and faulting. The mafic metavolcanics contain metasedimentary horizons, and more often, felsic volcanic interbeds. These are in some places porphyritic with ovoids of opalescent quartz, ranging in size from 1/16 inch to perhaps 3/8 inch, embedded in a fine-grained rhyolitic matrix. On a fresh cut the ovoids can be easily overlooked because of their small size and because of the masking effect of the brownish or grey colour of the rock. On the weathered surface, which is almost always dull white, they are evident even where strong foliation is present. As a rule the felsic interbeds are in sharp contact with the host mafic rock, and their thickness is commonly several inches to a few feet, in places 30 feet or more. It is difficult to determine the thickness and length of these interbeds when they are of large size because considerable stripping would be necessary. However there is evidence that they can thin and pinch off rather abruptly.

Equigranular medium-grained mafic, and possibly ultramafic, rocks that could be of intrusive origin are locally associated with the mafic metavolcanics. Metasedimentary rocks consisting of metasandstones, metasiltstones, and subordinate paragneiss with minor iron formation flank the metavolcanic series of the main belt to the east. The metasedimentary rocks outcrop on the main island of Kabinakagami Lake and in various localities on the eastern shore. To the south these rocks give place along strike to metaconglomerate, with very coarse-grained matrix and boulders, found slightly north of the first set of rapids of Kabinakagami River in northern Mosambik Township (outside map-area). The contact relationships of the metavolcanic belts with the granitic rocks vary from sharp to migmatitic. Epizonal porphyritic granite and epidotized granitic dikes displaying both concordant and crosscutting relationships characterize the first domain, whereas metamorphic diorite derived from assimilation of volcanic rock by the intruding granitic magma is found in the second.

The granitic rocks outside of the metavolcanic belt are generally foliated and show complex intrusive relationships. A common type is medium- to coarse-grained biotite-granodiorite that in places contains recognizable inclusions of older granitic rocks, and in which the feldspars and biotite are visibly altered to some extent. Other granitic rocks that may occur associated in

multiphase intrusions are: fresh-looking biotite trondhjemite and hornblende-biotite trondhjemite; coarse-grained leucocratic granite; medium-grained generally massive and homogeneous pink rock which is probably quartz-monzonite; biotite pegmatite; and, rarely, muscovite pegmatite.

The granitic rocks as well as all the other rocks are cut by diabase dikes, which are common throughout the map-area. The dikes trend predominantly northwest, and many are porphyritic and all the dikes almost invariably contain pyrite traces.

STRUCTURAL GEOLOGY: The metavolcanics of the main Kabinakagami Lake belt trend northeast and either dip subvertically or to the southeast, whereas the metasediments on the eastern shore and on the main island of the lake dip to the northwest. Two pillowed outcrops in central Lizar Township and one in southwestern Lizar Township indicate tops to the southeast. These data might be interpreted in terms of a synclinal fold with subhorizontal axis trending northeast. If this interpretation were correct, the metasediments would be younger than the metavolcanics to the west and their tops should face northwest. Since clear evidence of graded bedding was not found, the interpretation is tentative.

The physiographic character of the area west of the Hiawatha Mine suggests that the northeast-trending channel occurring there is the locus of a fault. Also a west-northwest-trending fault is probably present in southern Breckenridge Township north of Nameigos Lake.

ECONOMIC GEOLOGY: Most of the known mineral occurrences in the map-area are associated with the metavolcanic rocks of western Lizar Township. Apart from the Hiawatha Mine and the magnetite deposit drilled by Sand River Gold Mining Company Limited (see section on mineral exploration) there is record of mineral occurrences in six other localities of this township. The occurrences consist of associations of two or more among pyrite, pyrrhotite, galena, sphalerite, and chalcopyrite in each of these localities, and of associations of sulphide minerals with some gold in three of them. Detailed data on location, development and geological setting of these occurrences were compiled by P.E. Giblin (1968a, p.9-15). A brief review of these data show that quartz veins in metavolcanics are largely the host of both gold and sulphide minerals in the known occurrences. An auriferous vein, varying in width from 2 to 14 inches and 1,500 feet long, was apparently the target of most of the surface drilling carried out by Hiawatha Gold Mines Limited. A 25-ton per day amalgamation mill operated intermittently in 1937, 1939, and 1940 and gold having (then) a value of $6,826 was produced (ODM, Mineral Deposits File). No ore reserve data are available.

The ore reserve for the magnetite deposit of Boot Bay is indicated as 10-million tons grading 66.5 percent Fe (ODM, Mineral Deposits File).

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No.18 STOVER AND BRACKIN TOWNSHIPS

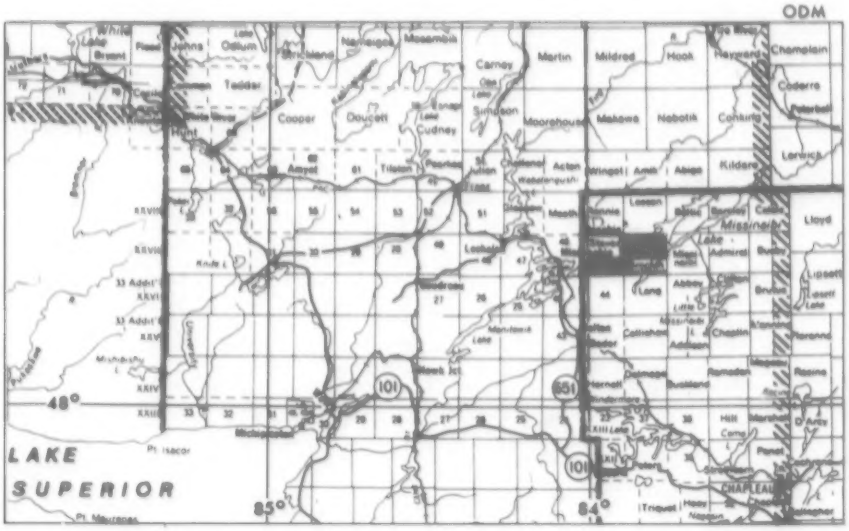
DISTRICT OF SUDBURY

by

Gerald Bennett[1]

LOCATION: Stover and Brackin are adjoining townships located about 125 miles north of Sault Ste. Marie and about 40 miles northeast of Wawa.

Much of the map-area is accessible during the summer months by means of recently constructed timber access roads extending southwards from a gravel



LOCATION MAP Scale: 1 inch to 25 miles

road between the Village of Missanabie and the Renabie Mine in Leeson Township.

MINERAL EXPLORATION[2]: There was little mineral exploration in the area until the discovery of the Renabie 'A' vein in Leeson Township in 1939. Mineral exploration in the Stover-Brackin area appears to have been concentrated on the search for gold-bearing quartz veins during the 1940s.

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[2]All information regarding mineral exploration and economic geology is from the Assessment Work Files, Ontario Division of Mines, Sault Ste. Marie, unless otherwise stated.

In 1971, Noranda Exploration Company drilled one hole to a depth of 455 feet in the northeastern corner of Stover Township. The only mineral exploration in the townships during the 1972 field season was that of Asarco Exploration Company of Canada Limited; this company staked groups of six claims each in Stover and Brackin Townships. Some ground follow-up was also done on these claims during the summer of 1972.

Most of the mining companies active in the area did some geological mapping, prospecting, stripping, and trenching. A few carried out some diamond drilling but no interesting discoveries were made except those noted below in the discussion of economic geology.

GENERAL GEOLOGY: The oldest rocks in the townships are probably the mafic metavolcanic flows that lie along the border of the 'greenstone' belt. These flow rocks are mainly massive, commonly pillowed, with local areas of amygdaloidal lava and flow-breccia. Intermediate to felsic metavolcanics are most abundant in Stover Township where they form at least one-third of the metavolcanic assemblage. The intermediate to felsic metavolcanics include pale grey to pale greenish grey dacite to rhyodacite with minor rhyolite. Units of tuff-breccia and tuff range from less than a foot to greater than 50 feet in thickness. For the most part the pyroclastic rocks consist of angular to subrounded fragments of intermediate to felsic metavolcanics set in a slightly darker matrix.

On the Renabie Road at the northwestern end of Baltimore Lake, there are good exposures of well-bedded, intercalated dark grey argillite, argillaceous siltstone, and metagreywacke, with a few conglomeratic units.

Thin, discontinuous beds of lean, chert-magnetite iron formation and some sulphide facies iron formation are scattered throughout the metavolcanic assemblage.

South of Crooked Lake the metavolcanics and metasediments have undergone a higher grade of metamorphism and are noticeably more amphibolitic and schistose.

Cutting the metavolcanics, but apparently not the metasediments, are sills and dikes of massive, medium- to coarse-grained quartz feldspar porphyry, and pale green to dark green metadiorite to metagabbro. The less coarse grained of these intrusive rocks are difficult to distinguish from some extrusive equivalents but chilled margins and massive structures are characteristic. In Stover Township, several occurrences were observed where quartz-feldspar porphyry sills were intruded by fine-grained, dark green to black chloritic rocks; this intrusion led to the formation of breccia containing elipsoidal or irregular fragments of porphyry having an appearance very similar to some pyroclastic breccias.

The metadiorite and metagabbro are highly variable in composition and texture and it is possible that they are of more than one age.

The southwestern part of Stover Township is underlain by the granitic rocks of the Ash Lake Pluton. This is a pale grey weathering, medium-grained,

slightly foliated biotite trondhjemite to granodiorite of relatively uniform appearance. The southeastern part of Stover Township is underlain mainly by the Ruby Lake Stock; a coarse-grained porphyritic, pink, quartz monzonite of uniform composition and texture.

The eastern part of Brackin Township is underlain by a well-foliated biotite trondhjemite with local areas of hornblende trondhjemite and quartz diorite.

All the major rock units are intruded by numerous northwest-trending and a few northeast-trending diabase dikes. Several dikes of biotite-rich lamprophyre are also present.

STRUCTURAL GEOLOGY: A few determinations of stratigraphic tops were made from graded beds in metasediments and pyroclastic rocks, and from pillow lavas, and these suggest a synclinal form for the belt. The axial trace trends southeast from the western end of Baltimore Lake, but the sparse data does not permit its precise delineation.

Northeast-trending topographic lineaments are prominent but they do not appear to be the result of any significant displacement. Several southeast-striking zones of shearing and ankeritization are present in metavolcanics in the northern half of Stover Township.

ECONOMIC GEOLOGY: Gold is, to date, the only metal that has been found in concentrations of economic significance in the map-area.

In 1942, gold was discovered on a claim of the Pileggi Prospecting Syndicate, about 1/2 mile south of Lanceley Lake in Stover Township. Surface work and prospecting revealed a zone of sheared and sparsely pyritized mafic metavolcanics containing stringers and blebs of rusty quartz. The shearing strikes southeast and dips steeply to the south. The width of the zone varies from a few inches to 3 feet and is at least 600 feet long with possible extensions making a total length of over 1 mile. No significant tonnage of ore grade has been found to date.

Also in the summer of 1942, the Pileggi Prospecting Syndicate found another gold-bearing zone just south of Stover Lake. This zone also strikes southeast and dips to the southwest. It consists of sparsely pyritized, sheared, and altered volcanic breccia with a total length of over 1/4 mile and widths of up to 350 feet. Gold assays are generally low.

In 1943, the property was optioned by Sylvanite Gold Mines Limited, and further sampling and surface work was done. The results of the assaying were not encouraging and the option was cancelled.

In 1961, Turzone Explorations Limited did further trenching and assaying, and drilled two holes totalling 1,001 feet. Assays were generally low with a maximum of 0.34 ounce of gold per ton over 4 feet.

A quartz vein at the northern end of a small lake about 1 mile southeast of the above property was also trenched and several channel samples

were taken by Sylvanite in 1942. The best assay indicated 0.9 ounce of gold per ton over 6 feet, but most other assays were too low to warrant further development.

In Brackin Township mineral exploration has been concentrated along the contact between the granitic rocks and the mafic metavolcanics. Braminco Mines Limited holds three gold-bearing veins in northern Brackin Township. As listed in the Canadian Mines Handbook (1948, p.32) surface work and diamond drilling by Braminco in 1946 and 1947 outlined the following reserves:

Vein	Reserves tons	Gold content ounces per ton
No.21	100,000	0.15
No.7	23,000	0.13
B	5,000	0.26

In 1947, Baltic Mines Limited held a group of 36 claims to the south and west of the Braminco Property. Considerable trenching, sampling, and diamond drilling was done over nine quartz veins and quartz vein networks within trondhjemite and quartz diorite. A report in the Assessment Work Files, Ontario Division of Mines, at Sault Ste. Marie, states that assays indicated erratic concentrations of gold.

Macassa Mines Limited held 19 claims in central Brackin Township in 1947. Geological mapping coupled with prospecting and a sampling program resulted in the discovery of a few 'high-grade stringers', but no persistent assays were obtained.

In 1965, Macabie Mines Limited staked 20 claims in central Brackin Township covering part of the property formerly held by Baltic Mines Limited. Seven diamond drill holes were drilled along with considerable surface work and sampling. The gold assays were again erratic and the property was allowed to lapse.

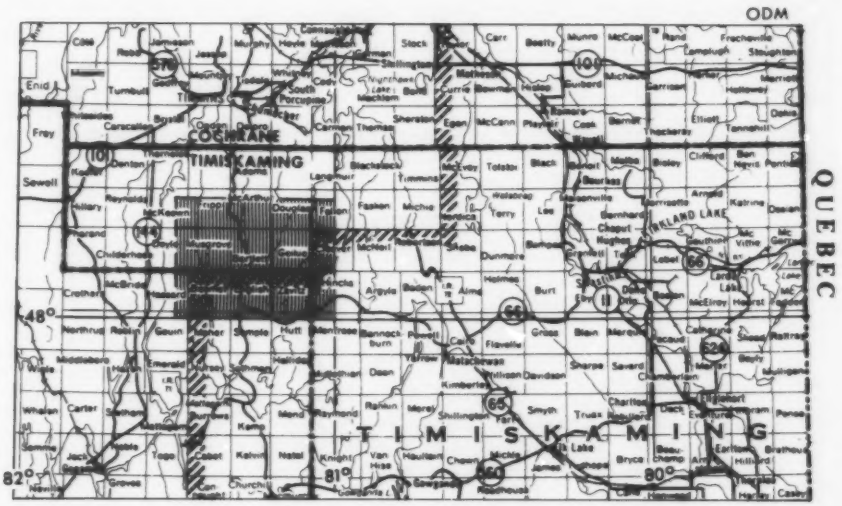
No.19 PETERLONG LAKE AREA

DISTRICTS OF TIMISKAMING AND SUDBURY

by

D.R. Pyke[1]

INTRODUCTION: In 1972, a new program of geological compilation and mapping was initiated for the Timmins-Kirkland Lake area. The program will lead to a series of geological maps to be published at a scale of 1 inch to 1 mile;



LOCATION MAP 1 inch to 25 miles

the boundaries of the map-areas will conform to the GSC Aeromagnetic Maps at the same scale. Currently it is planned to map two such areas a year; one in the general Timmins area, the other in the Kirkland Lake area. The program involves the following: (1) a compilation of geological information within the given areas; (2) mapping those parts of the areas that were previously unmapped (this may vary from outcrop mapping to a scale of about 1 inch to 1/2 mile, depending on the exposure and the complexity of the geology); and (3) remapping parts of the areas where warranted. The purpose of the program is to determine the general stratigraphy and main structural features in the areas, with a view to determining how these relate to the known mineral deposits. Ultimately it is hoped that the program will lead to a much better understanding of the stratigraphy throughout the entire Timmins-Kirkland Lake area. In 1972, the Peterlong Lake area and the Magusi

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River area (see L. Jensen, this report) formed the initial map-areas for the above program.

LOCATION: The Peterlong Lake area is located about 20 miles south of the Town of Timmins, and is bounded by Latitudes 48°00' to 48°15'N and by Longitudes 81°00' to 81°30'W. The area covers about 400 square miles.

ACCESSIBILITY: A large part of the central and southern part of the area may be reached by two roads; one extends south from Timmins across the west-central part of the map-area, and the other extends west from Matachewan to the southwestern corner of the map-area. Peterlong Lake provides access to parts of Musgrove and Beemer Townships, whereas much of the remaining area near the western boundary is best reached by float-equipped aircraft. Access to much of the northeastern part of the area is best via helicopter.

MINERAL EXPLORATION: Prospecting activity dates back to the early 1900s following the discovery of gold in the Porcupine and Matachewan areas. Although numerous gold occurrences were discovered, subsequent work failed to disclose any that were economically viable. Since the early 1950s exploration work has been directed toward the discovery of base metal mineralization; most of this work has been conducted in Bartlett, McArthur, and Fripp Townships.

In 1951, Dominion Gulf Company discovered nickel-bearing sulphides on a group of claims along the northern half of the Bartlett-Geikie township boundary. The property was subsequently acquired by Texmont Mines Limited (formerly Fatima Mining Company Limited). In 1971, the property was brought into production by Sheridan Geophysics Limited, who have a lease and profit sharing arrangement with Texmont Mines (Northern Miner 1971). Ore reserves are estimated at 3,800,000 tons grading 1.0 percent nickel after dilution (Northern Miner 1971).

During the period 1964 to 1971, Hollinger Mines Limited undertook detailed geological and geophysical surveys over much of the eastern half of Fripp Township. During this period 27 diamond drill holes were sunk, totalling about 9,500 feet (Assessment Work Files, Ontario Division of Mines, Resident Geologist's Office, Timmins); only minor mineralization was encountered.

In 1970, H.D. Carlson and associates optioned a copper property (Roch-dal property) near the southern part of Kitchiming Lake in Zavitz Township. Extensive stripping and trenching has outlined a zone of disseminated copper mineralization at least 800 feet long and 400 feet wide, grading about 0.2 percent copper (Assessment Work Files, Ontario Division of Mines, Resident Geologist's Office, Kirkland Lake). Further stripping and trenching is planned.

During the summer of 1972, Falconbridge Nickel Mines Limited completed detailed mapping on a group of claims northwest of Geikie Lakes. The property, largely drift covered, appears to be underlain mainly by ultramafic, and lesser mafic metavolcanics.

GENERAL GEOLOGY: Early Precambrian (Archean) metavolcanic and plutonic rocks underlie most of the area. Pleistocene and Recent deposits are particularly extensive throughout much of English Township and the central part of Bartlett Township.

Two cycles of volcanism are recognized in the area, each consisting of a lower unit of ultramafic metavolcanics[1], an overlying unit of mafic metavolcanics and an upper unit of intermediate to felsic metavolcanics composed largely of pyroclastic rocks. The ultramafic metavolcanics at the base of the first cycle are mainly confined to Fripp Township and are largely enclosed in granitic rocks forming the margin of an extensive batholith that extends into the western part of the area. Ultramafic metavolcanics at the base of the upper or overlying cycle are best exposed in the vicinity of McArthur Lake and the Bartlett-Geikie township boundary. Iron formation is largely confined to the intermediate to felsic metavolcanics of the lower cycle, and variolitic and amygdaloidal flows occur almost exclusively in the upper as compared to the lower sequence of mafic metavolcanics. The composite thickness of the two volcanic cycles is estimated to be in the order of 30,000 feet.

Minor felsic epizonal intrusions are largely confined to the lower metavolcanic cycle. Some may represent sub-volcanic intrusions.

A sill-like body of gabbro up to 5,000 feet thick was emplaced along the contact between the mafic and intermediate to felsic metavolcanics in Bartlett Township and part of English Township. Layers of pyroxenite, gabbroic anorthosite, and leucocratic to melanocratic gabbros are locally developed on a large (100 to 300 feet thick) and small (1 inch to 3 feet thick) scale.

A large stock of medium-grained porphyritic granodiorite underlies most of Geikie Township and parts of the surrounding townships. A similar stock extends into the northern part of the area in McArthur and Douglas Townships.

A large complex granitic batholith intrudes the metavolcanic rocks near the western boundary of the area. Two major intrusive phases are recognized; weakly to moderately foliated leucocratic quartz-rich biotite and(or) hornblende quartz diorite; and a massive, mesocratic diorite and quartz diorite characterized by the presence of blue opaline quartz.

Relatively flat-lying Middle Precambrian sedimentary rocks of the Cobalt Group form a series of high hills near the eastern boundary of the map-area. Locally the sedimentary rocks are in fault contact with the Early Precambrian rocks.

Diabase dikes are numerous, and probably represent at least three, or possibly more ages of Precambrian intrusion.

[1]Criterion for the recognition of ultramafic metavolcanics are given by Pyke (1971) and Pyke and others (in press).

Regional metamorphism of the Early Precambrian volcanic and sedimentary rocks took place under greenschist facies conditions. Contact metamorphic aureoles containing minerals indicative of the hornblende-hornfels facies border the granitic stocks and batholiths.

STRUCTURAL GEOLOGY: No major folds were detected in the northern part of the area, which appears to consist of a conformable northeast-facing sequence. In the southern part of the area the main structure is an easterly plunging syncline, the axial trace of which trends northeast in the eastern part of Zavitz Township, and east in the northeastern part of Zavitz Township. Minor north-trending open cross folds are developed along the south limb of the syncline.

Numerous regional north- to northwest-trending faults traverse the area.

ECONOMIC GEOLOGY:

Nickel: The Texmont Mine continued to produce nickel throughout 1972; concentrates are currently being stockpiled at the mine site. Other known nickel occurrences in the area are of minor importance and are generally associated with the ultramafic rocks, although trace amounts of nickel are found in some of the iron formations.

The sulphide minerals at the Texmont Mine consist of pyrite, pyrrhotite, pentlandite, and millerite, and occur typically as fine disseminations or as blebs or patches up to 1/4 to 1/2 inch in maximum dimension. The deposit occurs as two lenses that are near, but not at, the base of a body of serpentinized peridotite. Spinifex texture (Nesbitt 1971; Pyke et al. in press) is locally developed near the base of the peridotite and close to the ore zones, but no structures that are conclusive of a flow origin have been observed in the serpentinites in the vicinity of the ore zone. Nevertheless, the presence of spinifex texture suggests a relatively high level or subvolcanic origin (McCall and Leishman 1971) for at least part of the peridotite and similarly, perhaps the ore zones.

Copper: Minor and trace amounts of copper are associated with the siliceous sulphide-bearing iron formations throughout much of English Township and the central part of Bartlett Township.

Minor chalcopyrite is present in some of the subsidiary shear zones associated with the northerly trending faults in the area.

Copper mineralization occurs in pillowed, amygdaloidal, and locally variolitic mafic metavolcanics near the southern part of Kitchiming Lake. Sulphide minerals consist of chalcopyrite, pyrite, pyrrhotite, and bornite, and occur as amygdule fillings, massive sulphide stringers or as disseminations and patches in quartz and quartz-carbonate veins, minor disseminated grains or irregular patches, and as irregular fillings between pillow selveges. Malachite and minor azurite are common. Although the grade is low (0.2 percent copper over a surface area 800 by 400 feet, Assessment Work Files, Ontario Division of Mines, Resident Geologist's Office, Kirkland Lake)

further work is planned with a view to outlining a large tonnage.

Lead and Zinc: Lead-zinc mineralization has been known to occur near Little Night Hawk Lake in Cleaver Township since the early 1920s. Much of the mineralization is associated with quartz-carbonate veining in felsic pyroclastic rocks. Paymaster Consolidated Mines Limited examined various lead-zinc showings in Cleaver Township in 1956. The best recorded mineralization from diamond drill hole analyses (Assessment Work Files, Ontario Division of Mines, Resident Geologist's Office, Kirkland Lake) were from a showing 1/4 mile southwest of Little Night Hawk Lake, which contained up to 2.73 percent lead, 8.7 percent zinc, and 0.395 ounce of silver per ton over a length of 2 feet. The mineralized zone extends for a strike length of about 75 feet.

Pyrrhotite: A vein of massive pyrrhotite up to 3 feet thick occurs in a trench at the contact of ultramafic metavolcanics and sheared granitic rocks on the western shore of Donut Lake (local name) in northwestern Musgrove Township. The property was formerly explored by Hollinger Mines Limited, and is currently held by L. Dolan.

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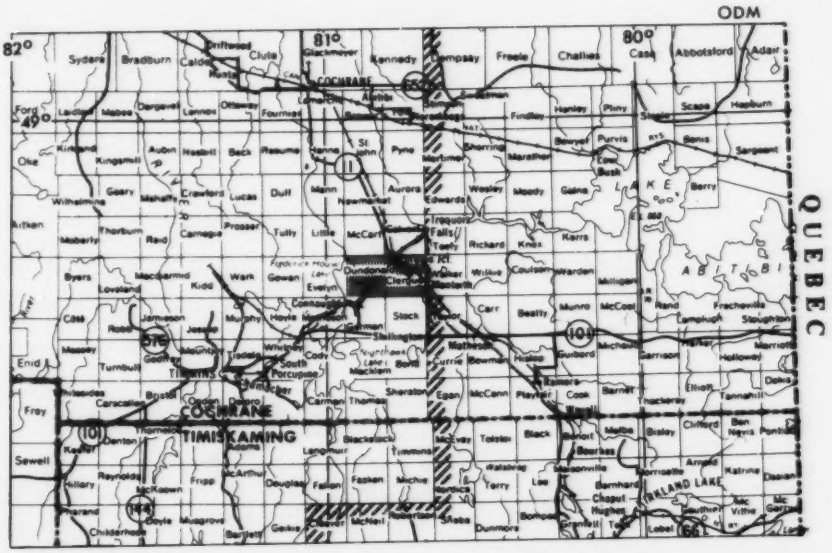
No.20 A MAGNETIC SURVEY OF DUNDONALD AND CLERGUE TOWNSHIPS DISTRICT OF COCHRANE

by

John A. McCance[1]

LOCATION: Dundonald and Clergue Townships are located 36 road miles northeast of Timmins, Ontario. Their combined areal extent of 72 square miles is bounded by Latitudes 48°30' and 48°45'N and by Longitudes 80°30' and 81°00'W.



LOCATION MAP Scale: 1 inch to 25 miles

Access is provided by Highways 610, 626, 11, and 67 connecting the area to Connaught, Porquis Junction, Cochrane, and Timmins respectively. The area is readily accessible by secondary and other roads. A spur line of the Ontario Northland Railroad from Porquis Junction to Timmins passes through Dundonald Township, and the ONR main line from North Bay to Cochrane passes through Clergue Township. A major marshalling yard is located at Porquis Junction.

Accessibility by water is extremely limited in Clergue Township. In Dundonald Township, the Frederick House Lake, and River system along with

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numerous smaller lakes may be used in areas otherwise inaccessible by land routes.

Numerous landing sites are present in both townships making access by helicopter feasible. Access by fixed-wing, float-equipped aircraft is limited to the western half of Dundonald Township. A private air base is located on McIntosh Lake.

MAGNETIC SURVEY: A relative, vertical field, ground magnetic map was obtained by utilizing surveys donated to the project and company surveys filed with the Ministry for assessment work credit. The data were compiled using a common magnetic datum established during the present field survey, with the relative differences between company survey values and present values, obtained by reoccupying a number of company stations in localities having a low magnetic gradient. Areas not previously covered were traversed with a Scintrex MF-2 (fluxgate) magnetometer and a Scintrex MFD-2 magnetometer. The latter, measuring the total vertical field component of the earth's magnetic field enabled the survey to be established on a relative magnetic base level that was invariant throughout the area surveyed. An arithmetic average of differences was applied to reduce the company survey datums to a Ministry of Natural Resources common base-level. This base-level was established by having both survey meters read in a base station network that selected a value of 875 ± 10 gammas at the Alexo magnetic base station and established a value of 1020 ± 25 gammas for the Bristol-Ogden magnetic base station (Moon 1972). The survey grid in areas not previously occupied consisted of line intervals from 400 to 880 feet with stations spaced 100 feet apart. Chain-and-compass techniques were used throughout the survey with air photographs at a scale of 1 inch to 880 feet used to provide location control. In areas of poor location control such as southern Clergue Township, chained base lines were cut.

Diurnal changes in the earth's magnetic field were recorded to an accuracy of 10 gammas using a McPhar M-700 (fluxgate) magnetometer and a Rustrak Model 288 recorder, powered by a 12-volt automobile battery. This recording arrangement was placed within 100 feet of the main survey base station in order to eliminate errors resulting from areal separation of the diurnal recorder from the base station (Riddihough 1971).

Several magnetic susceptibility values were obtained in the survey area. An ABEM Kappameter KT3 was used to measure the magnetic susceptibilities of outcrops, surface samples in situ, and diamond drill core samples. Further magnetic susceptibility tests will be run on a suite of diamond drill cores and outcrop samples representing all major rock types occurring within the area. These values will aid in the geological interpretation of the magnetic maps.

MINERAL EXPLORATION: Early exploration for gold and base metals was limited in the area; a result of the low percentage of outcrop. Reports describing the properties and prospecting activity prior to the 1950s are few, indicating a general absence of activity within this region.

In 1912, the Alexo Mining Company Limited commenced a program to develop

the Alexo Nickel Mine. Shaft sinking, stoping, and diamond drilling were completed before abandonment in 1919. The mine was reactivated by Harlin Nickel Mines Limited in 1943 but operations were terminated when ore reserves proved to be substantially smaller than estimated. In 1952, the property was acquired by Noranda Mines Limited. Several geophysical surveys and some diamond drilling have been carried out to date (EMR Mineral Resources Branch, Ottawa, 1972).

From 1938 to 1942, the Montclerg Gold Prospect in S1/2 lots 1 and 2, concession 1, Clergue Township, underwent an intensive drilling program carried out by Newmont Mining Corporation of Canada Limited and Anglo-Huronian Limited. Analyses were promising but no further work was completed until 1964 when an option was given to L. Torrance, with several holes being diamond drilled in 1964-1965 (Ferguson et al. 1971, p.51).

In the late 1950s and early 1960s, Noranda Mines Limited, Hollinger Consolidated Gold Mines Limited, Dominion Gulf Company, Quebec Asbestos Corporation, Alsof Mines Limited, and Falconbridge Nickel Mines Limited carried out extensive geological and geophysical surveys. All of these companies completed diamond drill programs with most of the work concentrated in southeastern and western Dundonald Township and southwestern Clergue Township.

This dramatic increase in exploration activities during the early 1960s prompted many prospectors to restake the area between McIntosh Springs and the Montclerg Prospect later in the decade.

In the period 1969 to 1971, American Metals Climax (AMAX) Incorporated, Hollinger Consolidated Gold Mines Limited, Dome Mines Limited, Falconbridge Nickel Mines Limited, and the Canadian Nickel Company (CANICO) conducted several ground magnetic and electromagnetic surveys with some diamond drilling being recorded in 1970.

At present CANICO and Falconbridge Nickel Mines Limited are conducting detailed electromagnetic and magnetic surveys in southwestern Clergue Township and southeastern Dundonald Township. Diamond drilling programs have also been initiated on their respective claim groups. Prospector R. Allerston has also been active and by September 1972 had restaked and cut several grids over a large part of the northern sector of Dundonald Township. A geophysical program of unspecified extent is to be conducted by American Smelting and Refining Company Limited (ASARCO) during the winter months (R. Allerston, personal communication 1972).

GENERAL GEOLOGY: Dundonald Township was originally mapped by W.L. Uglow (1911a) but no early mapping is recorded for Clergue Township. Preliminary mapping at a scale of 1 inch to 1/4 mile for both townships was completed in 1961 by R.M. Ginn (Ginn and Carlson 1965a,b). Reports by Uglow (1911b), M.B. Baker (1917), R.M. Ginn and H.B. Carlson (1965a), A.J. Naldrett and G.D.Mason (1968), and D.R. Pyke and R.S. Middleton (1971) summarize the main aspects of the geology in the area.

The largest number of outcrops (approximately 8 percent of the area) are

located in Clergue Township, principally in the southeastern quarter of the township. The bedrock, with the exception of the north-south diabase dikes, comprises metavolcanics, gabbros, and ultramafic intrusive rocks of Archean age. The metavolcanics range in composition from mafic to felsic and exhibit pillowed, massive, and fragmental structures. A succession of intermediate and felsic to intermediate pillow lavas are exposed in concession III, Dundonald Township immediately north of Frederick House Lake (Ginn and Carlson 1965a). Pillowed dacites located in the west-central part of Clergue Township are locally spherulitic. East of McIntosh Lake, in the southwestern quarter of Dundonald Township, dacite, intermediate agglomerate, and andesitic lavas are in contact with gabbro, pyroxenite, and peridotite. This latter assemblage forms the largest outcrop in Dundonald Township and although it shows good magnetic contrast with the surrounding metavolcanics, this differentiated ultramafic complex shows little magnetic character internally.

Drilling activity and magnetic data have further indicated that the dacites in lots 10, 11, and 12, concessions III and IV, Clergue Township, are underlain by the Alexo ultramafic complex; a possible differentiated ultramafic flow (D.R. Pyke, personal communication 1972). Similar evidence indicates the presence of ultramafic rocks beneath the succession of intermediate rocks in concession III, north of Frederick House Lake, in Dundonald Township.

Pyroxenite, locally very coarse grained, and peridotite are located to the southeast of the Alexo Mine, whereas west and north of Monteith Village gabbroic sills intrude a volcanic assemblage of tuff and massive, pillowed, and brecciated andesite.

Quartz veins tend to become more numerous near the gabbro masses. Numerous north-south diabase dikes cut the volcanic rocks to the west of Monteith Village.

STRUCTURAL GEOLOGY: Two fault systems have been identified from the geology and magnetic data. The Pipestone Fault zone, and faults in southeastern Dundonald Township, parallel one fault system that strikes N50E to N70E and dips at high angles. This system appears to be the oldest in the area. Numerous north-south faults, many of which coincide with the location of diabase dikes in the southeastern quarter of Clergue Township, comprise the second fault system. These faults are very similar to the group of fault systems having steep dips and strikes from 000° to 070° found throughout the Porcupine district (E.G. Bright 1972).

Earlier work (Ginn and Carlson 1965a; Naldrett and Mason 1968) has indicated the presence of several synclinal and anticlinal folds in the area.

ECONOMIC GEOLOGY:

Alexo Nickel Mine: Total output from all three producing periods in its history amounted to 56,780 tons of ore from which 4,472,000 pounds of nickel and 808,000 pounds of copper were recovered (EMR, Mineral Resources Branch, Ottawa, 1972). An assay carried out in 1918 (EMR, Mineral Resources Branch, Ottawa, 1972) further showed a combined platinum and palladium content of 0.03 ounce per ton.

The ore zone is at the base of a lens of serpentinized peridotite close to its contact with the underlying metavolcanics. The deposit consists of both massive and disseminated sulphide minerals. The massive ore (pentlandite, pyrrhotite, and chalcopyrite) is sheet-like, varying in thickness from a few inches to 5 feet. It is located along a shear zone at the peridotite-volcanic contact. The disseminated sulphide minerals (pyrrhotite and pentlandite) occupy a 5- to 15-foot wide zone within the adjacent peridotite (EMR, Mineral Resources Branch, Ottawa).

Montclerg Prospect: An area 4,300 feet long and about 500 feet wide in the southeastern corner of Clergue Township has produced low 'values' in gold. The gold occurs in a silicified area in lavas to the north of the Pipestone Fault zone. Drilling has indicated the gold to be associated with pyrite and arsenopyrite in a stockwork of quartz stringers (Ginn and Carlson 1965a).

Other Occurrences: Several occurrences in which minor sulphide minerals (chalcopyrite, pyrite, pyrrhotite) surround pillows in dacitic lavas were observed by the author in lots 10, 11, 12, concession III, Clergue Township.

Several quartz veins, and numerous gravel and sand deposits, have been thoroughly examined by shafts and pits.

Drilling in lots 10 to 12, concessions III and IV, Clergue Township, has located asbestos fibre up to 1/8 inch in length occurring in veinlets in serpentinized dunite (Hewitt and Satterly 1953). Similarly, Quebec Asbestos Corporation reported fibre in two surface outcrops of serpentinized dunite on lot 2, concessions I and II, Dundonald Township (Hewitt and Satterly 1953).

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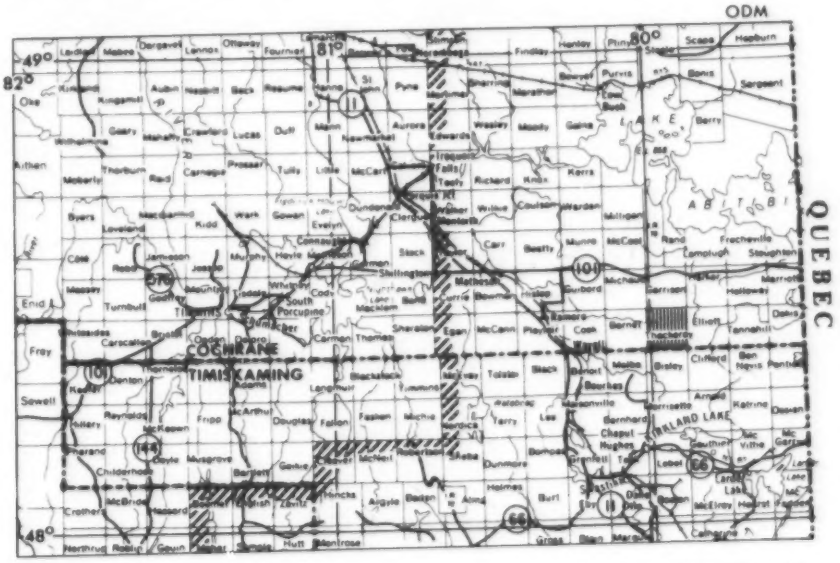
No.21 THACKERAY TOWNSHIP

DISTRICT OF COCHRANE

by

L.S. Jensen[1]

LOCATION: Thackeray Township is a 6-mile square township located 20 miles north of Kirkland Lake, Ontario. A logging road extends southeast through Michaud and Garrison Townships from Highway 101 and enters Thackeray Township



LOCATION MAP Scale: 1 inch to 25 miles

from the north. Several auxiliary logging roads and trails provide access to remoter parts of the Township.

MINERAL EXPLORATION: Thackeray Township was investigated in the late 1910s and early 1920s when several gold occurrences were discovered in Garrison and Harker Townships to the north. During this period, several pits and trenches were sunk on gold-bearing quartz-calcite veins and pyritic zones in the volcanic rocks.

The earliest recorded work was in 1947 when one hole, 1,007 feet long, was drilled on a claim (L49012) held by N.B. Keevil in the northeast part of

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[1]Geologist, Geological Surveys Section, Geological Branch, Ontario Division of Mines, Timmins.

Thackeray Township. Highest assay obtained was 0.03 ounce per ton Au over 0.8 feet (Assessment Work Files, Ontario Division of Mines) in altered volcanic rock cut by a pyritic quartz vein 2 inches wide. In 1947, Garthack Mining Company Limited did 300 feet of trenching and drilled 9 holes on a quartz stockwork containing minor amounts of disseminated pyrite and chalcopyrite, along the northern boundary of Thackeray Township. In 1948, the company also did a ground magnetic survey on the mineral showing.

Between 1950 and 1953, Dominion Gulf Company carried out a magnetic and a geological survey on two large blocks of claims along the boundary between Barnet and Thackeray Townships. A large amount of trenching, and drilling totalling 2,594 feet in 3 holes, was done in Thackeray Township. No analyses were reported.

In 1965, The International Nickel Company of Canada Limited drilled two holes totalling 1,017 feet in the northeast part of Thackeray Township on Claim L90434. Minor sulphide mineralization was reported (Assessment Work Files, Ontario Division of Mines).

In 1965, International Bibis Tin Mines Limited carried out magnetic and an electromagnetic survey on 33 contiguous claims southeast of Brinnie Lake in Thackeray Township. Three holes totalling 1,052.8 feet drilled on the property gave values of 0.04 percent Cu and 0.02 percent Ni over a width of 2 feet (Assessment Work Files, Ontario Division of Mines).

In 1966, Seeley Mining Corporation Limited did a magnetic and an electromagnetic survey on 18 contiguous claims in east central Thackeray Township. Since then no further work has been reported.

GENERAL GEOLOGY: All bedrock is of Archean age, except diabase dikes which are considered to be of Keweenawan age. The bedrock consists of alternating mafic and intermediate volcanic flows in which units of cherty felsic tuff, palagonitic tuff, tuff-breccia, and greywacke occur. Numerous dikes and stocks of syenite and feldspar porphyry cut the volcanic rocks.

The mafic volcanic rocks are predominantly diabasic to gabbroic, massive flows interlayered with variolitic pillowed volcanic flows and palagonitic tuffs of similar composition. The intermediate volcanic rocks are predominantly pillowed flows interlayered with thick units of pillow breccia and tuff-breccia. The cherty tuffs are less than 500 feet thick and are intercalated with the mafic and intermediate volcanic rocks.

The syenites vary from fine- to coarse-grained, porphyritic to non-porphyritic rock. They also range from light pink to deep red with varying amounts of mafic and sulphide material. Relationships among the varieties of syenite are difficult to determine because of the lack of exposure.

Metamorphic effects of greenschist facies rank occur along shear zones and near intrusive contacts with the syenites.

STRUCTURAL GEOLOGY: Except for two small isoclinal folds, in the northern part of the township, all the volcanic rocks strike east-northeast and tops face south at 80 to 85 degrees.

Faulting in the area is limited to regional east-northeast-striking block faults represented by narrow shear zones along which minor amounts of sulphide mineralization occur with quartz-calcite veins. A north-striking fault occurs under the Munro Esker in the eastern part of the township.

ECONOMIC GEOLOGY: Gold, chalcopyrite, and minor galena were the only economic minerals noted in the map-area. Gold associated with pyrite, chalcopyrite, and specular hematite occurs in quartz and silicified volcanic rock along the northern boundary of Thackeray Township. Assay values from 0.005 to 0.12 ounce of gold per ton were reported by Satterly (1949, p.25-26).

Chalcopyrite occurs as 1/8- to 1/2-inch blebs in quartz-calcite veins and as finely disseminated grains in the silicified volcanic wall-rocks and nearby syenite dikes along east-northeast-striking shear zones in the southwestern part of Thackeray Township, and south of Brinnie Lake. Both these shear zone occurrences are located in strongly magnetic mafic volcanic rocks.

Small cubes of galena were noted in drill core examined in the field. The galena occurs in small calcite veins associated with syenite in the southwestern part of the area.

Minor disseminated pyrite and pyrrhotite are ubiquitous in all bedrock.

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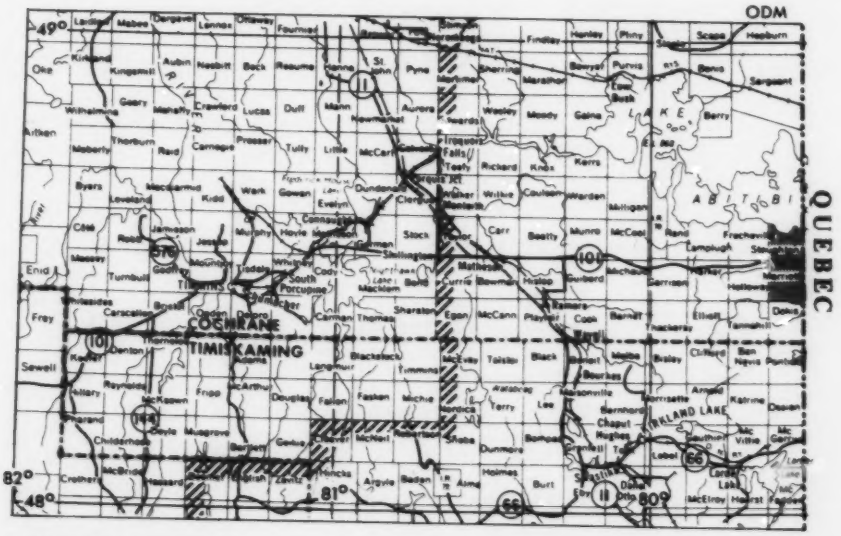
No.22 STOUGHTON AND MARRIOTT TOWNSHIPS

DISTRICT OF COCHRANE

By

L.S. Jensen[1]

LOCATION: Stoughton and Marriott Townships are located along the boundary between Ontario and Quebec south of Lake Abitibi, 40 miles east of Matheson, Ontario. The northern half of Marriott Township and the southern part of



LOCATION MAP

Scale: 1 inch to 25 miles

Stoughton Township are readily accessible from Highway 101, which crosses the northern part of Marriot Township. A gravel road extends north from Highway 101 near the west boundary of Marriot Township. This road leads to Lake Abitibi and provides access to the western part of Stoughton Township. The northeastern part of Stoughton Township is accessible by canoe on the Mattawasaga River and Lake Abitibi.

McDiarmid Lake is suitable for float-equipped aircraft and provides access to the southern half of Marriott Township.

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[1]Geologist, Geological Surveys Section, Geological Branch, Ontario Division of Mines, Timmins.

MINERAL EXPLORATION: Gold and minor amounts of chalcopyrite were discovered about 1905 along the south shore and on some of the adjacent islands of Lake Abitibi (Miller 1907). During this time several pits and trenches were sunk on gold-bearing quartz-calcite veins and pyritic feldspar porphyry dikes.

In 1917, after gold was discovered in Holloway and Harker Townships to the west, prospecting was concentrated in the northern part of Marriot Township where it was thought the extension of Porcupine-Destor Fault could be found. Little or no information about this early work exists but some pits found in the field are thought to represent early prospecting.

Between 1946 and 1948, four separate exploration programs were undertaken in search of the Porcupine-Destor Fault and possible associated gold deposits. In the northwestern part of Marriott Township, The Mining Corporation of Canada, Limited, conducted a magnetic survey on 37 contiguous claims and diamond drilled 6 holes totalling 3,496 feet. In the north-central part of Marriott Township, Lobanor Gold Mines Limited also did a magnetic survey. In the northeastern corner of Marriott Township, Teck Exploration Company Limited diamond drilled 3 holes totalling 2,133 feet, and Cortez Explorations Limited carried out geological mapping and drilled 11 diamond drill holes, totalling 909 feet, on its property south of the claims held by Lobanor Gold Mines Limited. Because these attempts in locating the Porcupine-Destor Fault proved unsuccessful, little or no work has since been done in search of gold in this area.

In 1927, Marriot Mines Limited was incorporated to develop a copper discovery on the east shore of McDiarmid Lake in Marriott Township. Approximately 18 holes, totalling 5,000 feet, were diamond drilled and 500 feet of trenching was done by the company (Kirkland Lake Resident Geologist's Files). In 1930, the property was sold to Alliance Mining and Securities Limited which subsequently dropped the property. In 1950, L. Merrell re-staked two claims and optioned them to Tenendo Mining Corporation Limited. The company subsequently dropped the option after diamond drilling 3 holes totalling 367 feet and finding no significant copper mineralization (Assessment Work Files, Ontario Division of Mines). In 1964, Copconda Mines Limited carried out an electromagnetic and a magnetic survey on the property without success. In 1969, Camflo Mines Limited optioned the property from G.C. Roy and diamond drilled two holes totalling 1,055 feet.

In 1971, The Patino Mining Corporation conducted an airborne electromagnetic and magnetic survey over Stoughton Township as part of a survey of a larger area south of Lake Abitibi. From the survey, anomalies were discovered in the southeastern part of Stoughton Township and northeastern part of Marriott Township. Follow-up work consisted of ground magnetometer and electromagnetic surveys and the drilling of 2 holes totalling 541 feet. Two 10-foot intersections averaging 0.06 percent copper, were found in the drill holes (Assessment Work Files, Ontario Division of Mines).

GENERAL GEOLOGY: All bedrock in Stoughton and Marriott Townships is of Archean age. The bedrock consists of mafic, intermediate, and felsic volcanic rocks intercalated with thin units of chert and jaspilite. A few dikes of feldspar porphyry and lamprophyre intrude the volcanic rocks. Metamorphic effects, representing the pumpellyite-prehnite-quartz facies (Winkler 1967)

and the lower part of the greenschist facies, are general throughout the area except in the northern part where the volcanic rocks are altered to upper greenschist facies by the granitic rocks to the north.

The volcanic rocks represent the lower part of a larger sequence of rock on the northern limb of a synclinorium, the axis of which is shown on the author's maps of the adjacent area (Jensen 1971a,b,c). Estimated thickness of the total volcanic sequence is in excess of 60,000 feet of which 35,000 feet occurs in the map-area.

The volcanic sequence in the map-area can be divided approximately into three parts according to composition. The lower part occurs in the northeastern part of Stoughton Township. It consists of alternating units of olivine basalts and quartz basalt intercalated with thin units of jaspilite. The jaspilite consists of alternating bands of jasper and iron oxides less than 1 inch thick. The basalts are in the form of massive and pillowed flows.

The middle part of the volcanic section occurs in the central part of Stoughton Township and the northern part of Marriott Township. Here the volcanic rocks consist of quartz basalts (tholeiites), and calc-alkaline high alumina basalts and andesites intercalated with finely laminated cherty tuffs and with carbonaceous argillites and tuffs up to 200 feet thick. The quartz basalts are mainly massive, fine- to coarse-grained flows, ranging from 10 to 800 feet thick. The andesites are mainly pillowed volcanic rocks interlayered with a few massive flows.

The upper part of the sequence occurs south of Highway 101 in Marriott Township. It consists of quartz-basalt, andesite, dacite, and one unit of rhyodacite. Interlayered with the massive and pillowed volcanic flows are palagonitic (aquagene) tuffs up to 200 feet thick and numerous units of pillow breccia and tuff-breccia up to several hundred feet thick. Many of the volcanic rocks are variolitic.

No stocks or sills of gabbro and diorite were found in the map-area. All the coarse-grained gabbroic rocks appear to be massive flows for which extrusive, fine-grained, variolitic and amygdaloidal contacts are easily found in the field. In a few locations dike-like intrusive feeders were mapped for some massive flows. Some thicker flows show minor changes in composition as the result of magmatic differentiation.

Felsic intrusions consist of one feldspar-hornblende porphyry dike on the eastern shore of McDiarmid Lake in Marriott Township and a few feldspar porphyry dikes on the southern shore of Lake Abitibi that are related to the granitic rocks farther north.

Lamprophyre dikes less than 3 feet wide cut the volcanic rocks in a few places.

STRUCTURAL GEOLOGY: General style of folding is concentric with the folding becoming more isoclinal to the north. Two folds occur in the area; a west-plunging syncline in the central part of Stoughton Township and a subparallel anticline in the southern part of Stoughton. South of this anticline, in

Marriott Township, all the volcanic rock tops face south and dip 60 to 80 degrees.

Previous geological interpretations of the area indicate that the Porcupine-Destor Fault extends eastwards through the northern part of Marriott Township. No evidence of any major movement was found in this area. However, a fault extension of the Porcupine-Destor Fault may occur in the southern part of Stoughton Township along the axis of the anticline.

Several east-northeast-striking strike faults occur in the volcanic rocks in Marriott Township. They appear to be related to a system of regional block faults represented by narrow shear zones.

ECONOMIC GEOLOGY: Minor disseminated pyrite and pyrrhotite are ubiquitous in the volcanic and sedimentary rocks. Sparse, disseminated chalcopyrite was also noted in a few localities.

Gold associated with chalcopyrite and pyrite occurs in quartz-calcite veins along brecciated fractures in the altered volcanic rocks on an island in Lake Abitibi. Here, the sulphide minerals occur as scattered blebs up to 1/2 inch in diameter. An assay value of $3.40 (0.2 oz.) per ton Au was reported on this vein (Miller 1907).

Minor disseminated chalcopyrite and pyrite occurs in silicified volcanic rocks on the eastern shore of McDiarmid Lake in Marriott Township. Recent diamond drilling (Assessment Work Files, Ontario Division of Mines) indicates pyrite mineralization continues downward to a depth of 600 feet and is probably related to the nearby hornblende-feldspar porphyry dike that also contains finely disseminated pyrite.

Recently explored graphitic sedimentary rocks in Stoughton Township contain up to 10 percent disseminated and nodular pyrite. Analyses reported in the Assessment Work Files of the Ontario Division of Mines indicate the pyritic graphitic sedimentary rocks contain up to 0.06 percent Cu over lengths of 10 feet. Sphalerite was also noted during field work (summer 1972) in similar graphitic rocks in the adjoining township of Frecheville.

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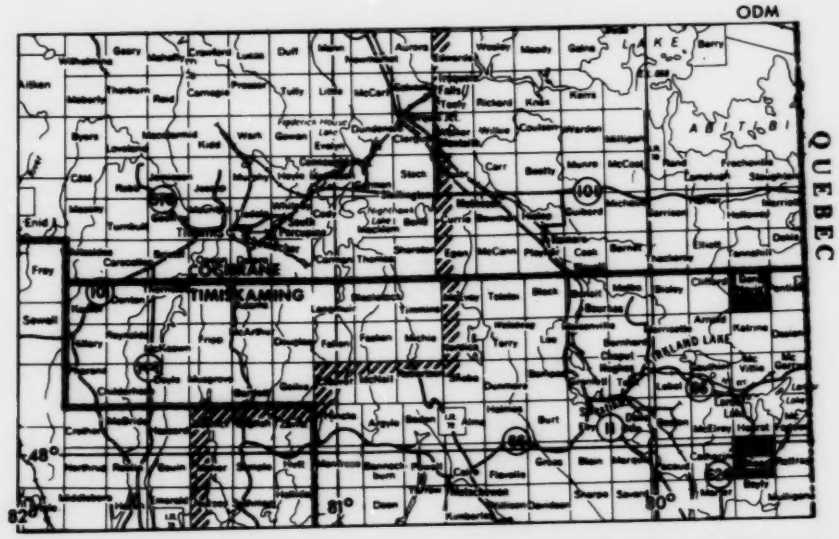
No.23 EXPLORATION GEOCHEMICAL RESEARCH IN BEN NEVIS AND SKEAD TOWNSHIPS DISTRICT OF TIMISKAMING

by

W.J. Wolfe[1]

Reconnaissance geochemical surveys, near centres of Archean intermediate to felsic volcanism in Ben Nevis and Skead Townships, combined studies of metal distribution in volcanic rock units with examination of metal dispersion



LOCATION MAP

Scale: 1 inch to 25 miles

in overlying Pleistocene glacial deposits near known base metal mineralization. The existence of (1) geological environments suitable for the formation of stratiform volcanigenic base metal sulphide deposits, (2) known sub-ore Zn-Cu-Pb-Ag-Au sulphides, and (3) reasonably good surface bedrock exposure, were the main criteria used in the selection of the specific survey areas.

Ben Nevis Township is located in the central part of the Abitibi Archean 'greenstone' belt, 21 miles northeast of Kirkland Lake and 30 miles west of Noranda, Quebec. Recent geological mapping by Jensen (1971) outlined a

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sequence of intermediate to felsic volcanic flow and pyroclastic units flanking a massive to porphyritic, sub-volcanic granodiorite-quartz diorite stock. Intermediate volcanic rocks consist of massive, pillowed, and flow-breccia flows, and pyroclastic units of agglomerate, tuff- breccia, lapilli-tuff, and tuff. Felsic volcanic rocks include massive rhyodacite, flow-breccia, tuff-breccia, lapilli-tuff, and crystal tuff. The layered volcanic assemblage is intruded by widespread mafic to intermediate sills, dikes, and stocks. Regional zeolite facies metamorphism has been up-graded to albite-epidote-hornfels rank near intrusive masses. The volcanic units are concentrically folded in open domal anticlines flanked by complimentary synclines. Volcanic strata are offset by regional northeast-trending faults and by local radial and concentric patterns of block faulting in west-central Ben Nevis Township.

The following paragraph is condensed from Jensen (1971). In east-central Ben Nevis Township, sphalerite, galena, chalcopyrite, pyrite, pyrrhotite, silver, and gold occur as massive replacement deposits in shear zones in altered rhyodacite tuffs and as disseminated sulphide minerals in adjacent tuffs. Massive sulphide vein deposits from 6 to 18 inches wide occur on a block of 13 patented claims held by Canagau Mines Limited. The largest of these has been traced to a depth of 325 feet over a length of 500 feet by underground exploration. Occurrences of chalcopyrite and chlorite filling vesicles in felsic volcanic rocks located west of Canagau Mines property were also reported.

In an area measuring 8,000 feet (east-west) by 5,000 feet (north-south) and extending south from the Canagau shaft, soils and glacial till were sampled at 50 locations to outline patterns of metal dispersal in glacial deposits situated 'down-ice' from known base metal sulphide subcrop sources. At each site samples were collected from the upper 'B' soil horizon and from parent glacial till scraped from the walls of 30- to 40-inch deep pits located along traverse lines trending normal to the local ice flow direction (S20E). Till samples weighing approximately 8 pounds were oven-dried at 80°C and passed through a nest of sieves containing 20, 80, 120, and 230 mesh screens. The relative proportions of each size range were measured in weight percent. The -80 +120 mesh, -120 +230 mesh, and -230 mesh fractions were each analyzed separately to determine relationships between trace element variability and particle size. Cu, Zn, Pb, Ni, Co, and Mn were extracted by a hot HNO_3-HCl leach and analyzed by atomic absorption spectrophotometry. Heavy minerals were separated in tetrabromethane (specific gravity 2.96) from sample material in the -80 +230 mesh size range. The heavy mineral concentrates were examined microscopically and were analyzed for Cu, Pb, Zn, Ni, Co, and Mn. The same elements were determined in the -80 mesh fraction of oven-dried 'B' horizon soils. Similar procedures were followed in the collection, preparation, and analysis of samples collected at 40 sites located north of Verna Lake near the southwestern corner of Ben Nevis Township.

Unweathered bedrock chips were collected at 1,000 outcrop locations in a 25-square mile area covering the southern two-thirds of Ben Nevis Township. Representative volcanic bedrock was sampled at more or less evenly spaced, but randomly distributed sites located by pace-and-compass traverses tied to recognizable features on 1 inch to 1/4 mile scale air photographs. Sample density was increased near known occurrences of base metal sulphide minerals north of Verna Lake and at the property of Canagau Mines Limited. The rock

samples were initially analyzed for Hg, Zn, Cu, Pb, Ni, Co, and Mn to determine patterns of metal distribution in relation to mineralized volcanic strata. Complete rock analyses of selected samples are being used to examine variations in major oxide constituents near mineralized volcanic units.

The central part of Skead Township is located 10 miles south of Larder Lake Village and about 12 miles northeast of Englehart. The township is underlain by a thick homoclinal sequence of Archean mafic to felsic lava flows and pyroclastic rocks bounded to the north by the Timiskaming Belt and unconformably overlain by Huronian Cobalt Series sedimentary rocks to the east. Geological mapping by Hewitt (1949) established the existence of a felsic volcanic centre on the eastern shore of St. Anthony Lake in the central part of Skead Township. An early subvolcanic quartz porphyry plug intruded intermediate to felsic fragmental lava, agglomerate, cherty tuff, tuffaceous sediments, and interbedded lava flows in the lower part of the series but formed fragments in the felsic pyroclastic rocks in the upper part of the volcanic series. Rhyolite flow rocks are locally porphyritic and are in some places difficult to distinguish from intrusive porphyry dikes, sill, and vent plugs. Pyrite is widespread, especially in the rhyolitic lavas and pyroclastic rocks but no base metal sulphide minerals were observed.

Samples of unweathered bedrock chips were collected at 166 locations within an area of approximately 2-square miles surrounding the felsic volcanic centre in Skead Township. The sample sites were located at intervals of 400 feet along chained picket lines used by Cominco Limited for TURAM and Horizontal Loop electromagnetic surveys during 1970. At each station approximately 1 pound of fresh rock chips was collected from outcrop surfaces. These samples are initially being analyzed for hot HNO_3-HCl leachable Cu, Zn, Pb, Ni, Co, Mn, and Hg.

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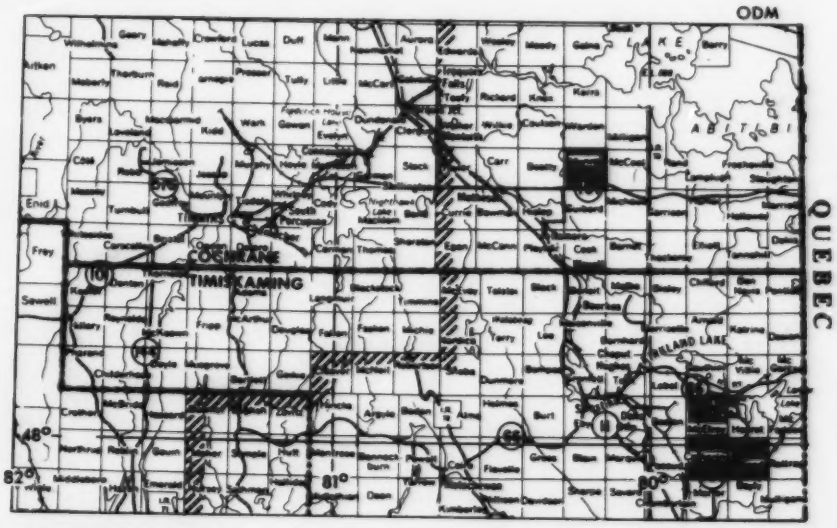
No.24 GEOCHEMISTRY OF ULTRAMAFIC ROCKS IN THE ABITIBI GREENSTONE BELT

by

W.J. Wolfe[1]

A 2-year project to study the geochemistry of ultramafic rocks in the Abitibi metavolcanic-metasedimentary belt was started during 1972. The principle objective of the survey is to determine the distributions of Cu,



LOCATION MAP

Scale: 1 inch to 25 miles

Ni, Co, and S within and between the ultramafic masses of the district, and to interpret the significance of these results as a possible aid to future exploration for copper-nickel mineral deposits. In 1972, samples of bedrock were collected from (1) an extensive serpentinized peridotite sill intruding Archean metavolcanic rocks, varying in thickness between 500 and 2,500 feet, and traceable in Skead, Catharine, and McElroy Townships over a strike

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distance of approximately 12 miles, and (2) peridotite 'flow' units in north-central Munro Township displaying distinctive flow-top breccia and spinifex quench textures of the type described by Pyke (1971) and Naldrett (1972). Samples from these two types of ultramafic occurrences are being examined petrologically and will be analyzed by total decomposition and partial leaching techniques to determine sulphur content and copper-nickel distributions.

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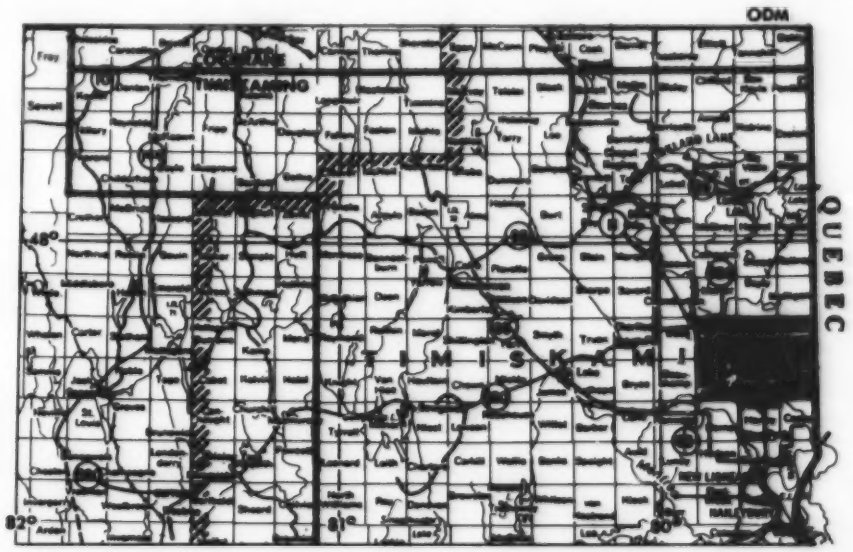
No.25 EVANTUREL, INGRAM, PENSE, ARMSTRONG, HILLIARD, AND BRETHOUR TOWNSHIPS DISTRICT OF TIMISKAMING

by

H.L. Lovell[1]

LOCATION: The map-area comprises six adjoining townships between the Kirkland Lake gold-iron-copper mining area and the Cobalt silver mining area. All townships, except Pense, are composed predominantly of farmland



LOCATION MAP Scale: 1 inch to 25 miles

containing a good network of concession and lot line roads. Also the Blanche River and its tributary the Englehart River, which traverse the area diagonally from northwest to southeast, are navigable without a single portage.

MINERAL EXPLORATION: Prospecting has been confined mainly to Ingram and Pense Townships, where showings of silver, lead, and copper have been discovered associated with Nipissing 'Diabase', and copper-lead associated with Early Precambrian volcanic and intrusive rocks, and Algoman-type

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intrusive rocks.

GENERAL GEOLOGY: Early Precambrian rocks include metavolcanics, intrusive rocks, and Algoman-type intrusive rocks. Middle Precambrian is represented by sedimentary rocks of the Cobalt Group and large areas of Nipissing 'Diabase'.

Flat-lying Paleozoic rocks, including Ordovician and Silurian limestone, shale, and sandstone, underlie the central part of the Englehart-Earlton area.

The map-area is at the heart of the Little Clay Belt farmland, which consists mainly of silt and clay that were deposited on the bottom of glacial Lake Barlow-Ojibway between about 10,000 and 9,000 years Before Present.

STRUCTURAL GEOLOGY: The Lake Timiskaming Rift Valley is represented in the map-area by two prominent northwest-striking faults, the Lake Timiskaming West Shore Fault and the Blanche River Fault. Most of the clay farmland and Paleozoic rocks are contained in the down-dropped rift block bounded by these faults.

Part of the course of Evanturel Creek, and the part of the Englehart River that is in the map-area, flows north along a distinct lineament. This lineament probably marks the location of an extension of the fault that is under the Munro Esker near Kirkland Lake, and that contains a strong aquifer. Englehart's municipal water supply is derived from wells near the probable fault, and Earlton's wells are about 1-1/2 miles east of the fault.

ECONOMIC GEOLOGY: Base metals occurring in Early Precambrian volcanic and intrusive rocks in the eastern part of Pense Township have been investigated recently.

Limestone has been quarried from the escarpment that is 2-1/2 miles southwest of Earlton. The limestone was used mainly as fill to construct Earlton Airport. In the early days, lime was produced in a kiln north of Earlton.

Large quantities of sand and gravel are available in Ingram and Pense Townships.

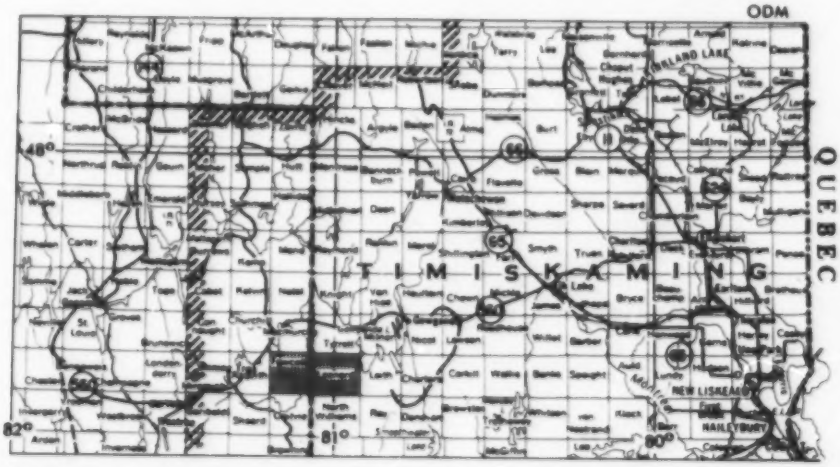
No.26 FAWCETT AND LEONARD TOWNSHIPS

DISTRICTS OF SUDBURY AND TIMISKAMING

by

M.W. Carter[1]

LOCATION: Fawcett and Leonard Townships straddle the boundary of the Districts of Sudbury and Timiskaming between Latitudes 47°29'30" and 47°35'N, and Longitudes 80°55' and 81°12'W. Access is moderately good. Fawcett Township



LOCATION MAP Scale: 1 inch to 25 miles

may be reached by a lumber road branching off from Highway 560 and Leonard Township by a bush road and hydro line road branching off the same highway. Highway 560 connects Elk Lake on the east with Canadian National Railways station, Westree on the west, and also with Highway 144 to the west. Fawcett Township forms part of the Shining Tree gold area, which comprises Churchill, Macmurchy, Asquith, and Fawcett Townships. Leonard Township forms part of the Shining Tree silver area.

Both townships were mapped at a scale of 1 inch to 1/4 mile during the summer of 1972.

MINERAL EXPLORATION: Exploration is hampered by poor outcrop density, especially in Fawcett Township. Initial interest in the two townships stemmed from the recognition of favourable geological conditions in Leonard Township for silver mineralization and in Fawcett Township for gold mineralization. Later, interest was shifted to exploration for base metals in both

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townships. Most of the information in the following two paragraphs is from Stewart (1913a,b), Langford (1927), and the Assessment Work Files of the Ontario Division of Mines.

In Leonard Township the first staking was done in 1908, and silver was first discovered in the form of native silver in 1909 on the claims of The Saville Prospecting and Exploration Company Limited. Considerable exploration activity followed. In 1912 a vertical shaft was sunk to 100 feet and a 200-foot east-west crosscut developed at the 100-foot level on the Caswell-Eplett prospect. In the same year a 34-foot deep shaft was sunk on the property of the Nellie Lake Syndicate. On the eastern shore of Mullen Lake, on the property of Walker Silver Mines Limited, a shaft 65 feet deep was sunk by McIntosh Mines Limited, the original owner of the prospect. During 1909-1912 surface exploration was carried out on the Archibald-Pope showing culminating in the sinking of an 18-foot shaft in 1926. In 1927, Leonard Silver Mines Limited carried out surface prospecting on its property. Revival of exploration activity began in 1955 when Newnorth Gold Mines Limited drilled 4 holes on their claims, totalling 168 feet. This work was followed by an electromagnetic survey in 1956, and the further drilling of 5 holes to an aggregate of 1,009 feet in 1957. During 1958-1959 Explorations Projects carried out geological mapping in the Bobtail Lake area as a preliminary for locating silver mineralization. Subsequently, in 1959, 7 holes were drilled for a total length of 2,206 feet. In the same year Paymaster Consolidated Mines Limited drilled 3 holes aggregating 836 feet in the neighbourhood of the shaft on the eastern shore of Mullen Lake. Then, in 1965, Silver Pack Mines Limited carried out geological mapping on their claims, and drilled 5 holes totalling 1,004 feet. This was followed by a geochemical survey in 1966. The most recent work carried out in the area was in 1971 when United Reef Petroleums Limited had six holes drilled on their property for a total length of 420 feet. Interest in iron ore deposits centred on iron formation occurring in northwestern and central Leonard Township, the latter occurrence being the more important. From 1910 to 1911 MacKenzie and Mann Limited carried out surface exploration on their property at Fournier Lake, but discontinued it in 1911.

In Fawcett Township staking began in 1918 when Messrs. Burke, Langagne, Cochrane, and Bulloch staked a group of claims on the northwestern part of Granite Lake near the mouth of Papoose Creek. A shaft was sunk to 35 feet and a crosscut was driven for 78 feet for gold. In 1925 surface exploration was carried out on the claims of Smillie and McDonnell for silver in central Fawcett Township. In 1950, Prospector Airways Company Limited drilled 7 holes for a total length of 1,005 feet on their property west of Granite Lake. This was followed in 1960 by the staking of 8 claims by Voyager Explorations Limited in the area of the Burke deposit, where 3 holes aggregating 318 feet were drilled. In 1966, Midrim Mining Company Limited carried out an electromagnetic survey in the northeastern corner of Fawcett Township. Following the discovery of an aeromagnetic feature in southeastern Fawcett Township, Ogilvie Syndicate carried out electromagnetic and magnetic surveys in 1966 and drilled one hole for 504 feet in 1967 to test the anomaly. From 1966 to 1971, Raylloyd Mines and Explorations Limited carried out magnetic and electromagnetic surveys and diamond drilling in the same area, drilling at

least 10 holes for a total footage of 4,888 feet. Finally in 1971, Jonsmith Mines Limited carried out pitting and trenching on their property for gold.

GENERAL GEOLOGY: Geological investigations began in the area in 1896, when Burwash (1896) examined the country along the Nipissing-Algoma line dividing Fawcett and Leonard Townships. Geological surveys continued until 1926, when Langford (1927) published a map of Leonard Township and the eastern part of Fawcett Township.

Fawcett and Leonard Townships are underlain by rocks belonging to the Archean and Proterozoic Eras of the Precambrian Eon.

The Archean rocks comprise metamorphosed volcanic, sedimentary, and intrusive rocks and the volcanic-sedimentary rocks may be subdivided into three sequences.

The earliest rock sequence, formerly referred to as the Keewatin, consists of an interbedded suite of basalt, andesite, dacite, and rhyolite and arenaceous rocks. This suite is best developed in the western and eastern parts of Fawcett Township although in eastern Fawcett Township, the sedimentary facies is absent and basaltic rocks predominate. The general occurrence of pillow structures in the basaltic-dacitic rocks, and the presence of interstratified sediments indicate that the sequence is sub-aqueous. Pyroclastic rocks are subordinate. In the vicinity of the Granite Lake pluton the rocks are metamorphosed to schists.

The second sequence, formerly referred to as Late Keewatin (Langford 1927) consists of intercalated volcanic and sedimentary rocks in approximately equal proportions. The volcanic rocks, however, are predominantly felsic, and range from dacite to rhyolite with minor andesite. The sedimentary rocks are both epiclastic and pyroclastic and mixtures of these. Amygdaloidal structure is observed in many of the volcanic rocks, but pillow structure is absent in the felsic volcanic rocks. Primary sedimentary features such as graded bedding, ripple marks, and flame structures are common and well preserved. Greywacke and conglomerate are the dominant types of sedimentary rocks. Oxide facies iron formation is also present and is best exposed at Fournier Lake in Leonard Township.

The third sequence comprises conglomerate and pyroclastic rocks; lavas are absent. This sequence was previously referred to as the Lower Cobalt (Langford 1927), however, the lithology of these rocks, plus the possible existence of a structural unconformity between this third sequence and the second suite, inferred from the distribution pattern of these units, suggests that this conglomeratic third suite is equivalent to the Timiskaming meta-sediments in the Kirkland Lake area. They occur east of Soot Lake, and west and north of West Wapus Creek in Leonard Township. The conglomerate, which is the predominant rock type, contains pebbles and cobbles of granite, rhyolite, banded iron formation, jasper, and quartz in a greywacke or dacitic matrix, indicating a local provenance. Arkose and lapilli-tuff are also present.

Felsic and mafic intrusions cut all these rocks. The major intrusion is the Granite Lake pluton, which is coarse grained, massive to foliated, and

consists of hornblende, hornblende-biotite, and biotite granite phases. Apophyses of granite porphyry and pegmatite occur. Minor intrusions consist of diabase dikes, granite porphyry, and peridotite. The diabase dikes trend northwest, north, northeast, and east-west.

The Proterozoic rocks,which are best exposed in Leonard Township, consist of sedimentary rocks of the Huronian Supergroup and diabase intrusions. The Huronian sedimentary rocks comprise conglomerate, arkose, greywacke, laminated argillite, and siltstone, unconformably overlying the Archean rocks. The Huronian is here represented by the Gowganda and Lorrain Formations of the Cobalt Group.

Nipissing 'Diabase' intruded the Huronian sedimentary rocks in the form of sills and dikes and consists of diabase, quartz diabase, and granophyre. Diabase dikes cutting the Archean rocks may also belong to the Nipissing-type.

STRUCTURAL GEOLOGY: The lower Archean sequence is folded about northwest-trending axes in western Fawcett Township. In eastern Fawcett Township the strike of the formations swings to a north-northwesterly direction and the fold axes are therefore interpreted as swinging into a more southerly trend towards the east.

The middle Archean sequence, exposed in northern Leonard Township, forms part of the western limb of a broad syncline with a northwest-trending axis. Towards the south, however, the rocks strike east-west, and considering the structure in the adjoining townships, the author suggests a basin structure is present. A structural unconformity may separate the lower and middle sequences.

The upper Archean sequence appears to be flat lying, and is interpreted to lie unconformably on the middle sequence.

The Huronian sedimentary rocks show broad open folds in general, but because of soft sediment deformation, sharp localized folds are present.

The Nipissing 'Diabase' occurs as sills in the Huronian rocks and shares the regional structure of this sequence. The diabase occurs as two sills; the lower sill has two parts that enclose Gowganda Formation conglomerate. The lower part is an interformational sill between the Huronian and Keewatin rocks.

ECONOMIC GEOLOGY:

Gold: Gold occurs in quartz veins in shear zones. The most important deposit is the Burke prospect in Fawcett Township. The vein consists of quartz, and strikes northwards. A crosscut intersecting the vein "passed through 14 feet of quartz and schist which yielded considerable gold on assay ...". "A rough sample" from the dump of the prospect "yielded $2.00 in gold per ton" (at approximately $20.66 per ounce; Hopkins 1920).

Iron: Iron occurs as oxide facies iron formation of Algoma-type. The most important deposit occurs at Fournier Lake, Leonard Township. The prospect consists of several bands of iron formation alternating with chlorite and

sericite schists; it strikes north-northwest for a length of 1-1/4 miles. The zone is up to 350 feet wide and contains magnetite, minor siderite, and hematite in a gangue of quartz (chert and jasper). Systematic sampling outlined a zone 10 to 50 feet wide and 4,000 feet long, containing 40.6 percent Fe, 15.4 percent SiO_2, 2.7 percent S, and 0.01 percent P. Selected samples attained 52 percent Fe (Data Retrieval Unit Files, Ontario Division of Mines; ODM 1923, p.211).

Pyrite: No important pyrite deposits were encountered but a marked increase in the background pyrite content was observed in the felsic middle sequence of the Archean rocks. Concentrations up to 20 percent were observed in places in rhyolite. The pyrite occurred in disseminated form in massive rhyolite, as well as in sheared rhyolite.

Silver and Cobalt: Silver was the metal most sought after in the exploration of Leonard Township. Cobalt usually accompanies the silver, and in some veins only cobalt minerals were found. Stewart (1913), who examined the silver-bearing veins, stated that they "... occupy vertical fissures that have a general strike of north, thirty to forty degrees east (magnetic)..." and that the veins varied from "... a few inches in width" to "... four to eight feet wide ...". The gangue was calcite and quartz. The more important deposits were:

The Archibald-Pope prospect consisting of a main calcite vein 18 feet deep and 6 inches to 8 feet wide containing silver, chalcopyrite, and galena; in addition there were 3 north-south-striking quartz-calcite veins 3 inches to 6 inches wide containing chalcopyrite, galena, and cobalt bloom (Langford 1927).

The Greave prospect, consisting of 3 quartz-calcite veins 3 inches to 6 inches wide containing silver, chalcopyrite, galena, and smaltite (Langford 1927).

The Leonard Silver Mines (formerly Turnbull) deposit consisting of a 200-foot long, 3- to 4-foot wide calcite vein striking N30E (magnetic), and another parallel vein up to 10 inches wide (Langford 1927).

The Neelands prospect consisting of 6 or 7 quartz-carbonate veins, a few inches wide, striking N60E and extending over a width of 300 feet; one of the veins showed silver for over 15 feet along its length; associated minerals are niccolite, chalcopyrite, and cobalt bloom (Langford 1927).

The Silver Pack Mines Limited (formerly Nellie Lake) deposit consisting of a 2-foot N25E-striking calcite vein in Nipissing 'Diabase'. The vein dipped vertically and was exposed for 8 chains. The best assay was 34 ounces of silver per ton, and 2.15 percent cobalt (Data Retrieval Unit Files, Ontario Division of Mines). The minerals present were silver, niccolite, smaltite, bismuth, and cobalt bloom (Langford 1927).

The Walker Silver Mines Limited (formerly Paymaster Consolidated Mines Limited) deposit consisted of a 6- to 8-inch quartz-calcite vein, several hundred feet long, and trending southwest with a steep westerly dip.

Chalcopyrite and cobalt bloom are present. Another very long 5-foot wide quartz-calcite vein occurs east of this, trending southwest, with a steep westerly dip. Chalcopyrite, niccolite, and cobalt bloom were observed (Data Retrieval Unit Files, Ontario Division of Mines; Langford 1927).

The Steep-Thomson deposit consisted of quartz-calcite veins striking N20E (magnetic) carrying niccolite, smaltite, chalcopyrite, and cobalt bloom (Langford 1927).

The Hedlund deposit was a quartz-calcite vein striking about northeast and several chains in length. It is 4 feet wide at one point, and contains smaltite, chalcopyrite, and cobalt bloom (Langford 1927).

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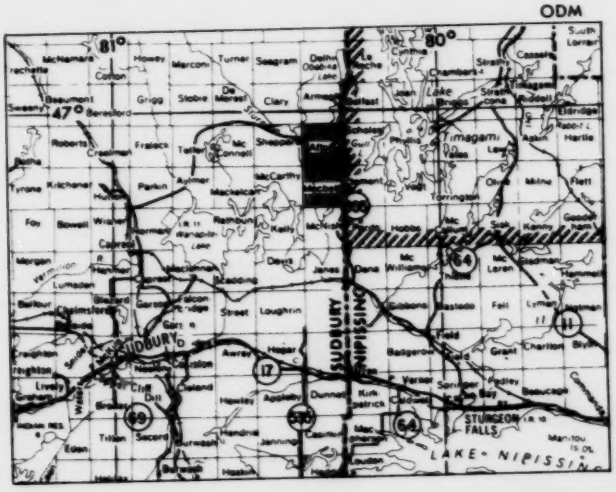
No.27 AFTON AND MACBETH TOWNSHIPS

DISTRICT OF SUDBURY

by

H.D. Meyn[1]

LOCATION: Afton and Macbeth Townships are each about 6 miles square and are located about 42 air miles northeast of Sudbury at the Sudbury-Nipissing district boundary. The mapping of these two townships is part of a continuing project and it is expected that Scholes and Clement Townships, adjoining these



LOCATION MAP Scale: 1 inch to 25 miles

two to the east, will be mapped in 1973. Access to the area is provided from Highway 17 via Highways 64, 539, and 805. Highway 805 runs northwards close to the eastern side of the two townships. Grassy Lake Road (local name), a former lumber road, crosses the centre of Macbeth Township and then continues up the western side of Macbeth and Afton Townships. Wawiashkashi (Grassy), Manitou, and Emerald Lakes are suitable for float-equipped aircraft.

The eastern half of Afton Township was mapped by E.S. Moore (1936). Additional information is available in Assessment Work Files of the Ontario Division of Mines. To the east, not immediately adjoining the two townships, mapping was done by P.S. Simony (1964) and J.A. Grant (1964). The area adjoining to the south was mapped by E.L. Bruce (1932) and by S.B. Lumbers (1971) of the Ontario Division of Mines, in 1971-1972.

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MINERAL EXPLORATION: Most of the mineral exploration in the map-area has been for gold. Interest in the area has been intermittent since before 1900 and culminated in the production of gold from the New Golden Rose Mine from 1937 to 1941. No active exploration was carried out in the two townships in the summer of 1972.

GENERAL GEOLOGY: The area is underlain by Precambrian rocks and partly covered by Pleistocene to Recent deposits of gravel, sand, clay, and organic matter. The oldest rocks of the map-area are volcanic and associated rocks of Archean age that are exposed in windows in overlying Proterozoic rocks, the Gowganda Formation of the Huronian Supergroup, and Nipissing Gabbro. The Archean rocks consist predominantly of felsic flows, pyroclastics and sediments with minor mafic flows and pyroclastics. A few bands of bedded iron formation composed of magnetite and chert, or jasper are also present. These rocks are cut by a small number of mafic and felsic intrusions. Of particular interest are grey feldspar porphyry intrusions that are associated with gold mineralization in iron formation. Older maps (Moore 1936) group these grey porphyry dikes with some pink porphyry rocks as Algoman granitic intrusions. No pink porphyry was seen in the map-area, by the field party, but porphyry of this type may be present to the east in Scholes Township. Moore (1936, p.41) outlined Timiskaming Series Sediments in Afton Township that are reinterpreted as being in part Archean pyroclastic and sedimentary rocks and in part Huronian sedimentary rocks.

The Archean rocks form the basement for the Huronian sedimentary rocks and the Nipissing Gabbro. The only Huronian rocks present in the map-area are sedimentary rocks of the Gowganda Formation. They comprise conglomerate, sandstone, and argillite, and in northern Afton Township, predominantly pebbly, fine-grained sandstone.

The Gowganda Formation sedimentary rocks are intruded by large sill-like bodies (sheets) of Nipissing Gabbro. It is not clear whether the whole area is covered by parts of just one sheet or by more than one sheet. The Nipissing Gabbro is variable in composition and appearance but the predominant lithology is medium-grained, fresh or uralitized, two-pyroxene gabbro, with erratically distributed patches of very coarse (pegmatitic) gabbro. The thickness of the gabbro sheet or sheets is estimated to have been between 800 to 1,200 feet; presently, because of erosion, it is much less in many places. Because the sheet is dissected and eroded to expose older rocks underneath it, the topography is very rugged.

All of these rocks are cut by olivine-bearing diabase dikes of probable late Proterozoic (Keweenawan) age. These vertical dikes extend for several miles, in many places in an en echelon pattern, in a northwesterly direction, and range up to a maximum width of 300 feet within the map-area.

The Sturgeon River occupies a valley in a large sandy plain formed by a much larger Pleistocene drainage system. Other gravel, sand, and esker complexes are found in the map-area.

STRUCTURAL GEOLOGY: The archean metavolcanics and metasediments have a well developed schistosity, which generally parallels bedding. These rocks have been isoclinally folded into a vertical position. Graded bedding and cross-

bedding are locally well preserved. In most outcrops the foliation is planar and consistent in strike direction, but in the iron formation complex folding is evident from the highly disturbed character of the bedding. Intraformational breccia in the iron formation was also observed.

The overlying rocks of the Gowganda Formation show little sign of disturbance and dips are probably original in most localities.

The contact of the Nipissing Gabbro with the Gowganda Formation rocks dips at 2 to 5 degrees over long distances and has not been folded.

The olivine-bearing diabase dikes, apparently following deep seated fractures, are fresh in their mineralogy; they crosscut all older rocks, but show minor offset on some late faults.

Faulting undoubtedly took place in the rocks of the map-area but because of lack of marker horizons in the gabbro, the predominantly exposed rock in the area, it is difficult to find physical expression of faulting in the field.

ECONOMIC GEOLOGY: Four bands of generally east-west-trending iron formation were found in the map-area. These are roughly coincident with aeromagnetic anomalies (GSC 1965) and except for minor gaps, can be linked along strike with iron formation exposed at surface farther east (Card et al. 1971). The iron formation is generally composed of interbedded chert or jasper, with magnetite and local patches of sulphide minerals. Iron content very rarely exceeds 30 percent, but substantial amounts of iron formation with 20 to 30 percent iron content are present. At the present time it appears that the amount of iron formation exposed at surface is not large enough for open pit mining, and although it is believed by the writer to extend below the Nipissing Gabbro, underground mining of this type of iron formation is uneconomic. This type of iron formation, if a tonnage large enough can be outlined for open pit operation, could be ore, as this type of iron formation is presently being mined 20 miles to the northeast at the Sherman Mine.

The iron formation is host to gold mineralization near intrusions of grey feldspar porphyry, as for example, at the former New Golden Rose Mine. The gold mineralization and the intrusion have so far only been found on the northernmost peninsula in Emerald Lake. The New Golden Rose Mine was in production from 1937 to 1941 and produced $1,666,563 in gold from 144,237 tons of ore (ODM 1950, Table VI, back pocket). The possible occurrence of similar gold mineralization in other parts of the iron formation should be kept in mind when assessing the economic potential of the iron formation.

Minor sulphide mineralization (less than 2 percent), mostly pyrite, was seen at numerous localities in the Archean rocks of the map-area; sulphide mineralization occurs in association with all Archean rocks of the map-area. Locally concentrations of up to 20 percent sulphide minerals were encountered in gossans at surface. Numerous pits around Cucumber and Arcand Lakes, Macbeth Township, indicate that a good deal of prospecting has been done there in the past. From the gossans and pits the author collected 26 samples. These were assayed and analyzed by the Mineral Research Branch, Ontario Division of Mines. The highest gold assay reported was 0.02 ounce per ton; copper, cobalt, nickel, manganese, and titanium are present only in trace amounts.

No mineralization has been found in association with the Gowganda sedimentary rocks of the Huronian Supergroup except local, small patches of pyrite and some single pyrite crystals.

The Nipissing Gabbro also appears to contain very little metallic mineralization. Very scattered specks of pyrite are present and locally sulphide concentration may reach 5 percent of the rock, but such zones seem to be very small and erratic.

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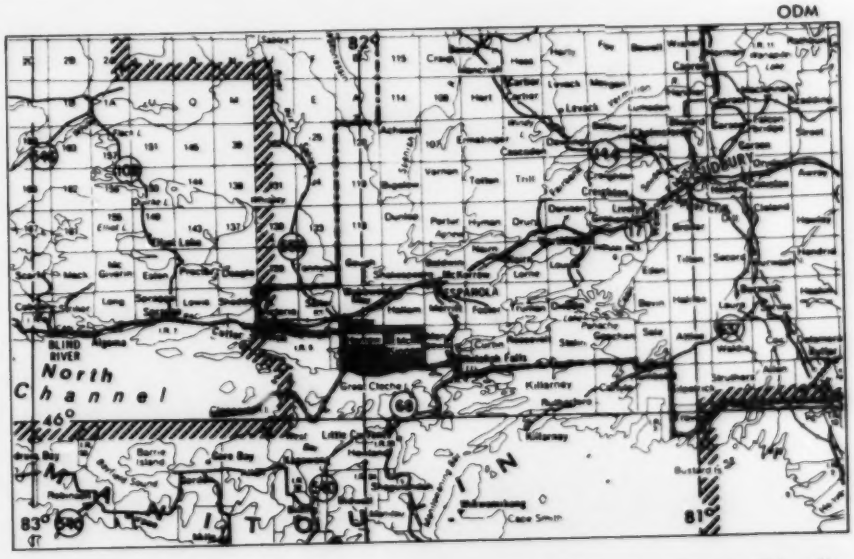
No.28 HARROW AND McKINNON TOWNSHIPS

DISTRICT OF SUDBURY

by

James A. Robertson and Krystyna Siemiatkowska[1]

LOCATION: The map-area lies on the North Shore of Lake Huron about 50 miles southwest of Sudbury and can be reached via Espanola or Massey. Primary access is from Lake Huron or by gravel road from Highway 17 serving La Cloche and Evangeline Lakes.



LOCATION MAP

Scale: 1 inch to 25 miles

MINERAL EXPLORATION: The area has been intermittently prospected for copper, nickel, gold, and uranium. One quartz vein has been quarried and the La Cloche Mountains are a potential source of silica. Exploration activity has been concentrated on the Evangeline Lake gold occurrence in lots 5 to 8 of concession III, McKinnon Township, where easterly striking quartz-carbonate veins adjacent to the Charlton Lake Fault (North Branch) carry gold in pyrite, chalcopyrite, and arsenopyrite. In 1934-1935 Bob Tough Gold Mines Limited carried out surface exploration and sank a 3-compartment shaft to the 150-foot level where 118 feet of crosscutting was done. Between 1954 and 1959 Bernard Day undertook surface mapping and diamond drilling (Resident Geologist's Files, Ontario Division of Mines, Sudbury).

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In 1955, Hercules Uranium Mines Limited carried out a geological and scintillometer survey in lots 3 and 4 of concession 1, Harrow Township. Between 1954 and 1959 minor exploratory drilling for copper, nickel, and radioactive minerals was undertaken adjacent to the north arm of La Cloche Lake. The results were not encouraging (Resident Geologist's Files, Ontario Division of Mines, Sudbury).

A quartz vein on lot 4, concession IV of Harrow Township has been quarried but no records are available.

The adjacent areas have been geologically mapped in recent years and maps at 1 inch to 1,320 feet and Open File Reports are available through the Ontario Division of Mines (see publications list, Ontario Division of Mines).

GENERAL GEOLOGY: The rocks of the area comprise: 1) the Huronian Supergroup consisting of slightly metamorphosed quartzite, argillite, greywacke, conglomerate, and carbonate; 2) post-Huronian mafic intrusions; and 3) Pleistocene and Recent unconsolidated sediments.

The Huronian rocks are subdivided into groups, formations, and where possible, members, as laid down by Robertson et al. (1969). The sedimentary rocks of Harrow Township have been studied by Chandler (1969).

The principal structures of the area are the east-trending folds of the Penokean Fold Belt (Card et al. in press). Outcrops of the mappable units are repeated by fold structures and by faults.

The oldest exposed rocks are those of the McKim Formation comprising argillite, greywacke, and quartzite. The McKim Formation is overlain conformably by the Ramsay Lake Formation which was originally considered to be the base of the Huronian (Collins 1925). This formation consists mainly of paraconglomerate containing pebbles of quartz, and mafic and felsic rocks, in a gritty protoquartzite matrix, with subarkose interbeds at the top of the formation. The Ramsay Lake Formation was probably laid down in a periglacial environment either from marine-based ice or from a series of mud flows (Lindsey 1969).

The Ramsay Lake Formation is overlain by the Pecors Formation, which is lithologically similar to the McKim Formation and which grades vertically and laterally into the Mississagi Formation.

The Mississagi Formation comprises medium- to coarse-grained feldspathic quartzite, quartzite, and protoquartzite. Both fining- and coarsening-upward cycles are found, although coarsening-upward cycles, which are indicative of beach or deltaic environment, are the most common (Palonen 1971). Studies of crossbedding indicate shifting currents derived primarily from the northwest and northeast. The quartzite is generally pyritic but hematitic varieties are not uncommon. Calcareous feldspathic quartzite was found locally near the top of the formation. Quartz-pebble bands were also found but these have no economic significance.

The Mississagi Formation is overlain conformably to disconformably by the Bruce Formation, a polymictic paraconglomerate with pebbles and cobbles

scattered through a dark grey, siliceous greywacke matrix characterized by scattered pyrite and(or) pyrrhotite and minor carbonate.

The Espanola Formation is an assemblage of carbonates, siltstones, and quartzites showing crossbedding, shrinkage, and slumpage structures. A laminated calcareous sandstone unit lies at the top of the formation and grades into the overlying Serpent Formation rocks.

The Serpent Formation comprises medium- to coarse-grained feldspathic quartzite and quartzite with minor siltstone and conglomerate. The quartzites are generally pyritic; carbonate may also be present. The arenites may be laminated, cross-laminated, or massive. Crossbedding is well developed and indicates both northwest and northeast derivations.

The Serpent Formation is overlain by the Gowganda Formation. Within the map-area the contact is apparently conformable but regionally it is disconformable (see ODM maps of adjacent areas). The sequence of paraconglomerates, argillites, greywackes, and quartzites, comprising this formation, is similar to that described from Whitefish Falls by Lindsey (1969) and Casshyap (1969). The formation is generally interpreted (Lindsey 1969; Casshyap 1969) in terms of a periglacial environment with bodies of till intermittently dropped from floating ice. The Gowganda Formation is marked by: 1) magnetic anomalies (GSC 1965; ODM 1952; ODM-GSC 1963) corresponding to laminated argillite sequences containing magnetite; and 2) by hematitic quartzites. The preservation of iron oxides is in marked contrast to the sulphide minerals characteristic of the Lower Huronian rocks.

The Gowganda Formation is conformably overlain by the Lorrain Formation, which is well exposed in the spectacular La Cloche Mountains. The Lorrain Formation is divided into 5 members, which in succession upwards comprise: 1) protoquartzite-feldspathic quartzite sequence transitional from the Gowganda Formation and marked by slumpage structures, crossbedding, and graded bedding; 2) crossbedded, pebbly, greenish weathering arkose; 3) a buff weathering crossbedded arkose with oligomictic pebble bands, and with hematite and aluminous minerals, partially represented by kyanite; 4) thickly bedded white orthoquartzite with minor aluminous minerals; and 5) white cherty quartzite with local coloration due to minor impurities. The upper two members have been quarried elsewhere (see ODM maps for adjacent areas) for silica, and within the area contain material suitable for this purpose (personal observation). The presence of aluminous minerals (represented by kyanite and andalusite retrograded to kaolinite) instead of detrital feldspar suggests deposition in tropical conditions (Chandler et al. 1969).

The Gordon Lake Formation, the youngest sedimentary unit exposed in the map-area,only occurs in the core of the La Cloche Syncline and is composed of cherty argillite, protoquartzite, and quartzite. The unit is marked by an aeromagnetic anomaly (GSC 1965; ODM 1952; ODM-GSC 1963).

The post-Huronian mafic intrusions comprise: 1) the Nipissing 'Diabase' (2,155 million years, Van Schmus 1965), differentiated gabbro-diorite sills partially amphibolitized and bearing minor copper-nickel mineralization; 2) a series of thin amphibolite dikes; and 3) three olivine-bearing diabase

dikes of the Sudbury Swarm, which are the youngest rocks of the area (1,225 million years, Van Schmus 1965) and post-date the major metamorphic events and all but the youngest faults.

STRUCTURAL GEOLOGY: The Huronian rocks were subjected to a long deformational and metamorphic history accompanied by intrusion of mafic dikes and sills. In argillaceous rocks there is evidence of several deformations. The map-area is part of the Penokean Fold Belt and the structures are ascribed to the Penokean and Hudsonian orogenic disturbances (Card et al. in press). Many rock units show tectonic pinch and swell and some, particularly diabase intrusions, show boudinage. The principal structures are the east-west-trending Bass Lake Syncline, the Fox Lake Anticline, and the La Cloche Syncline; the two latter are isoclinal folds with near vertical limbs and near horizontal axes locally plunging either east or west. The Bass Lake Syncline is a moderately open canoe-shaped fold, in which the Gowganda Formation rocks are well-exposed. Major faults are subparallel to the folds but northwest- and northeast-striking transcurrent faults are also found. Brecciation and silicification zones are associated with many of the faults.

ECONOMIC GEOLOGY: Only the quartz veins carrying auriferous sulphide minerals found adjacent to the Charlton Lake Fault system have had significant exploration. These and similar occurrences to the east (Assay results show up to 0.74 ounce gold per ton, average 0.04 ounce gold per ton; Assessment Work Files, Ontario Division of Mines) are likely to be further explored as the price of gold increases. Traces of copper and nickel (Assessment Work Files, Ontario Division of Mines) are found in the Nipissing 'Diabase' but there has been little encouragement for concentrated exploration.

Quartzite of the upper part of the Lorrain Formation constitutes a resource (Hewitt 1963) but at this time other localities are more accessible. Sand and gravel are obtained in northwestern Harrow Township where there is also local mixed farming.

Tourism and lumbering remain the most likely spheres of economic activity.

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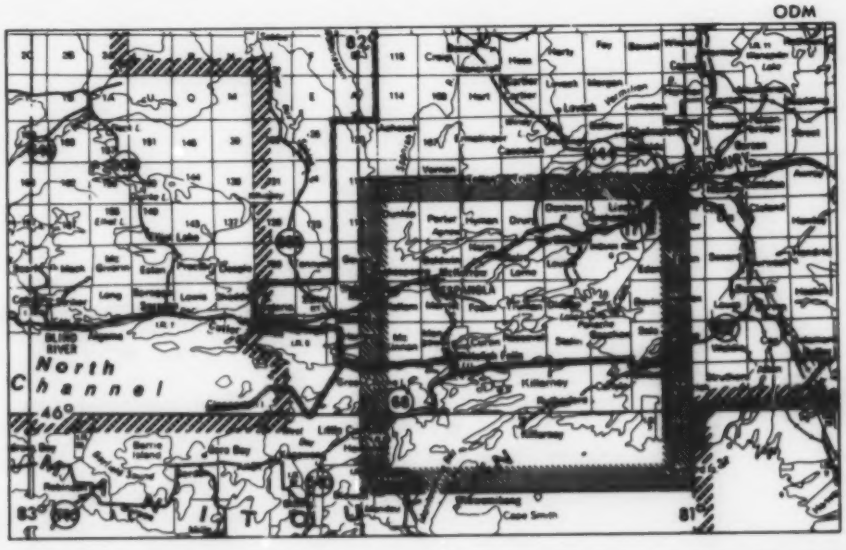
No.29 PANACHE LAKE AREA

DISTRICTS OF SUDBURY AND MANITOULIN

by

K.D. Card[1] and D.G. Innes[2]

LOCATION: The Panache Lake area, Districts of Sudbury and Manitoulin, is bounded by Latitudes 45°50' and 46°30'N and by Longitudes 81°00' and 82°00'W. The area lies southwest of the City of Sudbury.



LOCATION MAP

Scale: 1 inch to 25 miles

MINERAL EXPLORATION: There are numerous past producers in the area and many occurrences of base metals, gold, and uranium. Exploration and development work at the Lockerby property of Falconbridge Nickel Mines Limited in Denison Township has been suspended temporarily as have operations at the Crean Hill and Totten Mines of The International Nickel Company of Canada Limited. Silica quarrying operations continued at The International Nickel Company's Lawson Quarry near Whitefish Falls and at the Badgeley Island Quarry of Indusmin Limited near Killarney. Exploration was carried out by St. Joseph Explorations Limited on a tungsten occurrence in Foster Township.

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GENERAL GEOLOGY: Field work carried out during 1972 consisted of mapping previously unmapped parts of the area, checking and remapping of problem areas, and detailed stratigraphic and structural investigations of selected areas. Such work was carried out in Vernon, Baldwin, Truman, Roosevelt, Fairbank, Creighton, Snider, and McKim Townships.

The Panache Lake area includes parts of the Superior, Southern, and Grenville Provinces of the Canadian Shield. Most of the area is occupied by the Huronian Supergroup of the Southern Province, a sequence of Proterozoic supracrustal rocks that were deformed and metamorphosed during the early Proterozoic. The Huronian succession, with a total cumulative thickness of approximately 35,000 feet, consists mainly of metamorphosed sandstone and pelitic, and conglomeratic rocks. However, in tha basal part of the sequence near Sudbury and at several localities westward to the Cutler area, there are appreciable amounts of mafic and felsic volcanic rocks and turbidite-type greywackes. The volcanic rocks probably represent fissure eruptions emplaced at an early stage of the evolution of the Proterozoic basin. Their emplacement was apparently controlled by faults bounding the basin in its early stages of development.

In the Sudbury area, the lower, volcanic part of the sequence can be subdivided into three conformable lithostratigraphic formations: a lower unit up to 4,000 feet thick consisting mainly of thick basaltic flows and associated mafic intrusions, the 'Elsie Mountain' Formation; a unit up to 3,000 feet thick consisting of approximately equal proportions of basaltic flows and intercalated metasediments, the 'Stobie' Formation; and a unit up to 2,500 feet thick of felsic (rhyolitic, dacitic) flows and pyroclastic rocks, the 'Copper Cliff' Formation.

Chemical and petrographic investigations carried out mainly by Innes (1972) show that the sequence is subalkalic, tholeiitic, and slightly potassic. There is apparently a dearth of intermediate (andesitic) volcanic rocks. However, there are slight but distinct differentiation trends upwards in the sequence in terms of major and minor element variations and petrographic indices.

Most of the intercalated pelites and greywackes, which are probably tuffaceous in part, are similar to the associated volcanic rocks in terms of bulk chemistry and chemical variations, indicating a close genetic as well as spatial relationship. These metasediments contain appreciable amounts of sulphide minerals, mainly pyrrhotite and pyrite with minor chalcopyrite. The amounts and types of sulphide minerals vary systematically within the cyclically intercalated volcanic flows and metasediments.

There are also intercalations of quartz-feldspar sandstone and quartz-pebble conglomerate within the sequence. These have a granitoid provenance, and were probably derived from the Archean terrain to the north. To the west in the Agnew Lake area, the basal volcanic-greywacke assemblage gives way to a sequence of quartz-feldspar sandstone and uranium-bearing oligomictic quartz-pebble conglomerate, the Matinenda Formation.

Mapping was carried out in Vernon Township to investigate the stratigraphy and structure of a salient of Huronian rocks extending northwards into the

Archean terrain. The supracrustal rocks have been folded about a north-south synclinal axis, a structure that trends at right angles to the dominant east-west tectonic axis of the main part of the Huronian Belt. The dominant east-west deformation is reflected in the salient rocks by east-west foliations that cut across the synclinal axis at a high angle. In spite of the deformation, it is clear that the Huronian salient fills an embayment, a 'paleovalley' in the Archean basement, and does not represent part of an infaulted or upturned collar of Huronian rocks surrounding the Sudbury 'astrobleme' structure as has been suggested by French (1972). The unconformity at the base of the Huronian sequence was seen at several localities along both sides and at the northern end of the salient.

Rocks of the Gowganda and Lorrain Formations are present in the northwestern end of the salient. They are assymetrically disposed with respect to the main fold axis as defined by the lower Huronian formations, indicating a possible unconformable relationship between the upper and lower parts of the sequence. However, direct field evidence for such a relationship could not be found.

Mapping in Roosevelt and Curtin Townships reveals the presence of a large block, consisting of rocks of the Gowganda Formation, which is stratigraphically out of place. This block trends east-west parallel to the regional strike, is approximately 5,000 feet thick and 8 miles long, is bounded by poorly-defined faults, and is extensively brecciated and folded at its eastern and western ends. It may have been emplaced by gravity sliding during an early stage in the tectonic evolution of the region.

ECONOMIC GEOLOGY: The Huronian metavolcanic sequence contains numerous minor occurrences of copper- and nickel-bearing sulphides, indicating the possible presence of deposits of economic potential. However, no sizeable deposits have yet been discovered in spite of appreciable exploration activity over the past 50 years. There are many similarities between the Huronian volcanic sequence and base metal-rich Archean greenstone belts, but there are several differences. The Huronian sequence is tholeiitic; many of the Archean belts are calc-alkaline (Irvine and Baragar 1971). The Huronian volcanics apparently display only one mafic to felsic volcanic cycle; most Archean belts display several such cycles and generally only the last cycle contains important base-metal deposits. The Huronian volcanics, although metamorphosed under conditions corresponding to the greenschist and almandine-amphibolite facies of regional metamorphism, display little evidence of silicification, carbonitization, or similar reworking and concentrating processes so evident about base-metal concentrations in Archean belts.

It is possible that these differences in differentiation trend and amount of alteration account for the apparent lack of base-metal concentrations in the Huronian sequence. However, it is also possible, as suggested by Card and Hutchinson (1972), that later volcanic extrusive-intrusive activity at Sudbury is represented by the Nickel Irruptive and the Onaping Formation. It is in association with these later cycles that we would expect to get, and indeed do get, major concentrations of base-metal sulphides.

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No.30 MATTAWA-DEEP RIVER AREA

DISTRICT OF NIPISSING AND COUNTY OF RENFREW

by

S.B. Lumbers[1]

LOCATION: The Mattawa-Deep River area covers about 2,100 square miles between Longitude 79°00'W and the Ottawa River. The southern boundary is Latitude 46°00'N; the northern part of Algonquin Provincial Park and the

LOCATION MAP Scale: 1 inch to 25 miles

Towns of Mattawa, Deep River, and Chalk River are included in the area. During the 1972 field season only part of the westernmost quarter of the area was mapped, at a scale of 1 inch to 1 mile.

MINERAL EXPLORATION: Deposits of iron, titanium, vanadium, molybdenum, uranium, rare earths, magnesium, beryllium, garnet, feldspar, mica, graphite, kyanite, and sand and gravel have been explored and utilized in the Mattawa-Deep River area, but present production is confined to sand and gravel used mainly for local construction purposes. Recent exploration activity, carried out mainly in the 1960s has centered upon concentrations of iron-titanium oxide minerals in anorthositic intrusions.

GENERAL GEOLOGY: Mapping was confined to the townships of Antoine, Olrig, Mattawan, Calvin, Papineau, Boulter, Lauder, Boyd, Wilkes, Pentland, and

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northern Cameron Township. These townships are underlain mainly by rocks of the Grenville Province of the Canadian Precambrian Shield, and they contain many of the lithologic units recognized in the adjacent North Bay area to the west (Lumbers 1971a). The oldest rocks, probably Middle Precambrian in age, are mainly clastic siliceous metasedimentary gneisses derived from subarkose, arkose, shale, and relatively impure and poorly sorted sandstones. Calc-silicate gneiss derived from calcareous shale and sandstone is widespread as minor intercalations in the siliceous metasediments and is most abundant in the relatively well sorted metasandstones. Minor marble derived from dolostone and limestone is present as inclusions in the eastward extension of the Bonfield Batholith (Lumbers 1971a) in Olrig and Calvin Townships.

A large variety of igneous rocks intruded the metasediments and underlie about 40 percent of the area mapped. The oldest intrusions are a few relatively thin sheets of metagabbro and gneissic quartz monzonite all of which are probably Middle Precambrian in age. Late Precambrian rocks of the anorthosite suite constitute most of the igneous material and form at least six intrusions. The largest intrusion, the Bonfield Batholith, is composed of monzonitic and syenitic rocks that extend westward from southern Olrig, western Calvin, Lauder, and northern Wilkes and Pentland Townships into the adjacent North Bay area (Lumbers 1971a). Immediately northeast of this batholith, a complex anorthositic intrusion underlies most of eastern Calvin, northeastern Lauder, Papineau, and northern Boyd Townships and may be slightly older than the Bonfield Batholith. The western part of this intrusion consists largely of anorthosite and gabbroic anorthosite with subordinate sheets and dikes of tonalite, alkalic syenite, quartz syenite, and monzonitic rocks, whereas the eastern part consists largely of tonalite and subordinate monzonitic and syenitic rocks. The intrusion appears to be sheet-like with some primary igneous layering and is complexly folded, but fine-grained felsic and mafic dikes and brecciated intrusive phases are common locally near the margins, and the body was possibly emplaced at a relatively high structural level. Concentrations of iron-titanium oxide minerals are found locally in anorthositic phases. Parts of four other complex sheet-like bodies of anorthosite suite rocks were mapped; two in Mattawan Township, one in eastern Papineau Township, and one in northeastern Pentland Township. All of these bodies consist mainly of tonalite and syenitic to monzonitic rocks with only locally developed anorthositic phases.

The metasediments and intrusive bodies were subjected to a Late Precambrian high-rank regional metamorphism that caused all the foregoing rocks to be recrystallized and deformed into gneisses. Locally, some of the rocks, particularly the metasediments, are migmatitic due to the presence of discontinuous granitic veinlets developed by a combination of partial melting and metamorphic differentiation. Granite pegmatite dikes, most of which are zoned mineralogically and strike northeastward, were emplaced during the waning stages of the regional metamorphism. The largest and most abundant dikes are either within or nearby the intrusive rocks, and they contain a variety of accessory minerals. Following the Late Precambrian high-rank regional metamorphism, diabase dikes, probably Late Precambrian in age, were emplaced along west- to northwest-trending faults, and lamprophyre dikes, probably Cambrian in age, were emplaced near the Mattawa River Fault, which forms the northern boundary of the Ottawa-Bonnechere Graben (Lumbers

1971a). During the Pleistocene, the area was subjected to continental glaciation.

STRUCTURAL GEOLOGY: The gneissic metasediments and most of the intrusive rocks are complexly folded with relatively tight, recumbant folds predominating. Foliation surfaces dip mainly southeastward, but near the largest intrusive bodies, complex dome and basin structures dominate the metasediments. Both the metasediments and intrusive rocks near the Bonfield Batholith are particularly intensely deformed suggesting that the batholith acted as a buttress during deformation accompanying the high-rank regional metamorphism.

The area contains numerous faults forming two major systems: 1) a north to northeast system; and 2) a west to northwest system. These two systems also prevail in adjacent areas to the north and west (Lumbers 1971a,b), and faults of both systems are marked by prominent zones of granulation and mylonitization. All the faults underwent late deformation relative to the culmination of the Late Precambrian regional metamorphism, and diabase dikes in the area are associated with faults of the west to northwest system. Some of the diabase dikes underwent further faulting following their emplacement.

The Mattawa River Fault, a westerly trending structure marking the northern margin of the Ottawa-Bonnechere Graben in the adjacent North Bay area (Lumbers 1971a), continues eastward along the Mattawa and Ottawa Rivers. Wide zones of cataclasis, mylonitization, brecciation, and hematitization mark the fault zone in the present map-area and are accompanied locally by carbonate veins, by narrow zones of fenitization, and by lamprophyre dikes. This fault has had a long and complex history and is presently seismically active with minor earthquakes recorded annually along its trend. The southern boundary of the graben is marked by a wide zone of block faulting that extends southward beyond the map-area. A second zone of block faulting, which is also seismically active, extends northwestward along the Ottawa River north of the Town of Mattawa, and can be traced for over 200 miles beyond the northern boundary of the area.

ECONOMIC GEOLOGY: Iron and titanium mineralization, chiefly in the form of titaniferous magnetite and ilmenite, are associated with anorthositic rocks in Calvin and Papineau Townships. In both deposits, the iron-titanium oxide minerals are richly disseminated in layers conformable with the gneissosity in the host anorthositic rocks, and both deposits are near the contact of the anorthosite bodies with host metasediments. Peerless Canadian Explorations Limited explored the Calvin Township deposit in 1959 by 2,000 feet of diamond drilling. The mineralization zone is poorly exposed, but may be more than 10 feet thick in places. The Papineau Township deposit is described by Harding (1944a) and was explored by diamond drilling in 1966 by Union Carbide Exploration Limited. Titaniferous magnetite at the Papineau deposit also contains small amounts of vanadium. A third deposit of iron-titanium oxide minerals in a mafic-rich metagabbro in Mattawan Township was explored several years ago by surface trenching and a few shallow pits. No information has been obtained on the workings. In Olrig Township, on the north shore of the Mattawa River within the Mattawa River Fault and about 1/4 mile east of Paresseux Falls, an old adit was

driven into intensely fractured and hematitized rocks of the Bonfield Batholith. The workings, known as Porte D'Enfer to the earliest European explorers in the region, was probably opened by pre-historic Indians for ochre and could constitute one of the earliest mining ventures known in Ontario. Archeological studies are currently being carried on at the site.

Late pegmatite dikes are particularly large and abundant within and nearby gneissic intrusive rocks in the townships of Calvin and Papineau, and southern Olrig and Mattawan Townships. The dikes strike north to northeast, are commonly zoned mineralogically, and dip subvertically. Dike widths are variable and range between about 5 and 200 feet. Most dikes pinch and swell along strike, and they can only rarely be traced for more than about 500 feet. Many of the relatively large dikes were either explored or mined for feldspar and muscovite from the 1920s to the early 1950s, and several hundred tons of feldspar and a few thousand tons of mica concentrates were produced. The Purdy Mica Mine in Mattawan Township, one of the largest past producers of mica in Ontario, contained muscovite of exceptionally high purity and operated during the 1940s and early 1950s. In addition to muscovite, feldspar, and quartz, the following minerals of possible economic significance occur as minor accessory constituents in the various pegmatite dikes: molybdenite, uraninite, pyrochlore, rare earth minerals, iron-titanium oxide minerals, beryl, fluorite, and tourmaline. Nearly all of the reported occurrences of pyrochlore and rare earth minerals are from pegmatite dikes that cut across anorthosite suite rocks.

Inclusions of marble in rocks of the Bonfield Batholith in Olrig and Calvin Townships contain concentrations of brucite which were explored as a possible source of magnesium in the 1940s (Harding 1944b; Lumbers 1971a). Metamorphosed calcareous shale containing minor disseminated pyrite and pyrrhotite and locally abundant fine flakes of graphite are intercalated with the marble units locally and were explored in the late 1800s for copper.

Metasediments derived from well sorted sandstones and shales exposed in Antoine Township locally contain coarse-grained porphyroblasts of kyanite in units generally less than 200 feet thick. The abundance of the kyanite in the units is difficult to estimate, but locally, this mineral could comprise as much as 25 percent of the rock.

Coarse garnet crystals as much as 3 inches across are developed locally in anorthositic rocks and associated alkalic syenite and are particularly abundant in the anorthositic complex underlying parts of Calvin, Papineau, Lauder, and Boyd Townships. A few shallow pits were blasted into garnetiferous anorthosite in southern Calvin Township.

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1971b: River Valley area, Districts of Sudbury and Nipissing; p.90-96 in Summary of Field Work, 1971, by the Geological Branch, edited by E.G. Pye, Ontario Dept. Mines and Northern Affairs, MP49, 109p.

RIVER VALLEY AREA

DISTRICTS OF SUDBURY AND NIPISSING

by

S.B. Lumbers[1]

The River Valley area covers about 750 square miles northeast of the City of Sudbury between Longitudes 80°00' and 80°45'W. The southern boundary is Latitude 46°30'N, and the northern boundary extends eastward from the southeastern end of Wanapitei Lake along the northern boundary of the townships of Scadding, Davis, McNish, and Pardo to the southern end of Lake Temagami in Vogt Township.

Reconnaissance mapping of most of the area at a scale of 1 inch to 1 mile was completed during the 1971 field season, and about seven weeks were spent in the area during the 1972 field season to complete the mapping and to examine mineral deposits. Major features of the general, structural, and economic geology of the area were described previously (Lumbers 1971).

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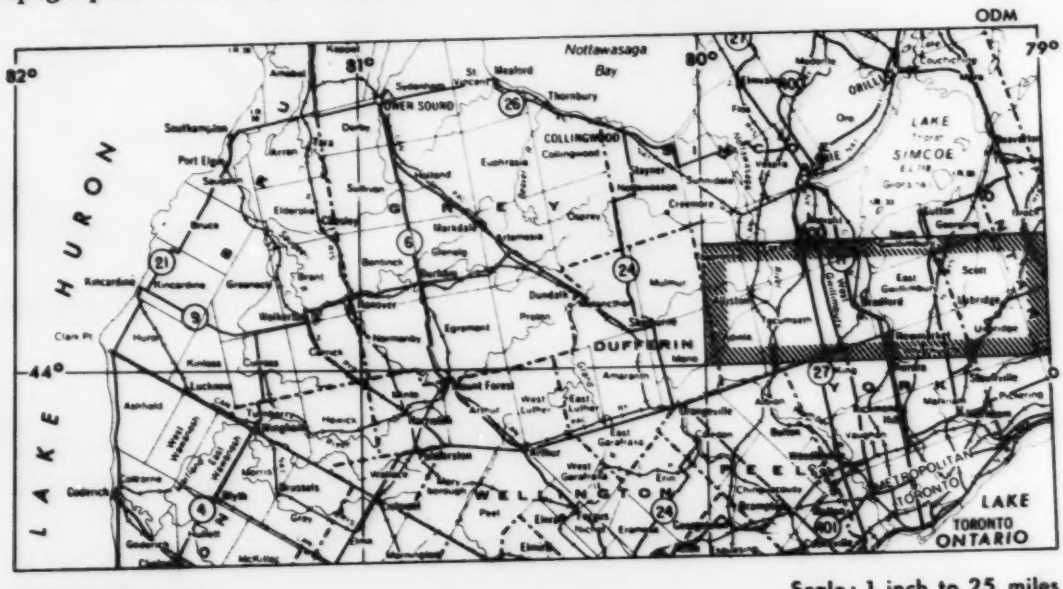
No.31 QUATERNARY GEOLOGY OF THE ALLISTON-NEWMARKET AREA SOUTHERN ONTARIO

by

Q.H.J. Gwyn[1]

LOCATION: The map-area is bounded by Latitudes 44°00' and 44°15'N, and Longitudes 79°00' and 80°00'W. The area comprises the Alliston and Newmarket Topographic Sheets (NTS 31D/4, 31D/3). The principal settlements are the



LOCATION MAP

Scale: 1 inch to 25 miles

Towns of Alliston, Aurora, Cookstown, and Newmarket. Mapping was carried out during the summer of 1972.

PHYSIOGRAPHY: The Alliston-Newmarket area is characterized by a series of northeast-southwest-trending broad ridges that are composed predominantly of till. Numerous drumlins and drumlinoid forms are developed on them. Based on the present field work the ridges predate the last major glacial advance (i.e. pre-Late Wisconsinan Substage). The ridges are separated by valleys

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filled with lacustrine and outwash sands and silts. In the vicinity of Alliston, Holland Landing, and Mount Albert, the valleys formed embayments of glacial Lake Algonquin. It was the first major glacial lake to form in the Georgian Bay area at the end of the Wisconsinan Glaciation (Deane 1950).

GENERAL GEOLOGY: The only bedrock exposed within the map-area is found in the extreme western part of the Alliston map sheet, in the vicinity of Rosemont. Red shales of the Queenston Formation and interbedded shale and limestone of the Georgian Bay Formation, both of Ordovician Age, are found in several outcrops (Liberty 1969). Elsewhere the bedrock is covered by 30 to 140 metres (100 to 450 feet) of Quaternary sediments.

All the Quaternary sediments exposed in the map-area were deposited during the Port Bruce Stadial of the Late Wisconsin Substage (less than 20,000 years old). Four till units constitute the framework of the stratigraphic succession. Three of the tills (northern till) were deposited by the southward and southwestward flowing Georgian Bay-Lake Simcoe Lobe. The fourth till unit (southern till) was deposited by a northward flowing segment of the Ontario Lobe.

The oldest northern till, here named the Bogarttown Till, is a massive, compact, pebbly, sandy silt till. It has been identified in five sections throughout the area beneath other sediments, but it is not present at the surface. The till is 2 to 4 metres (6 to 12 feet) thick and it overlies ice-contact sand and gravel.

The middle northern till, here named the Newmarket Till, is a pebbly sand to silty sand till, usually very compact but which exhibits a fissile structure after being exposed at the surface. This is the most prominent till in the map-area, it has been traced from the Niagara Escarpment 65 kilometres (40 miles) east to Lake Scugog in Reach Township. Also it is believed that Newmarket Till is present below Niagara Escarpment in the Collingwood map-area, northwest of the present map-area. Newmarket Till ranges from 0.5 metre to 12 metres thick (1.5 to 36 feet). It is most commonly underlain by outwash sand and gravel and in four locations it directly overlies the Bogarttown Till.

The Newmarket Till is the 'lower northern till' of White (1971). He concluded that the Newmarket ice built both the Singhamton and Gibraltar Moraines. If this is the situation, the Newmarket Till is possibly the correlative of Till 'N' of Karrow (1971). Till 'N' was tentatively traced to the flank of the Singhampton Moraine northwest of Dundalk (Cowan, this volume).

The last till, deposited by the southward flowing ice lobes, here named the Kettleby Till, is a clayey silt to silt till. It contains 1 percent pebbles, is moderately compact, and has a blocky structure. The Kettleby Till ranges in thickness from 0.5 metre to 12 metres (1.5 to 36 feet), although usually it is 1 metre to 2 metres thick (3 to 6 feet). It typically overlies laminated or varved lacustrine silt and clayey silt, although in several sections the Newmarket Till lies directly beneath it. Evidence was found for two minor advances of the ice during the deposition of the Kettleby

Till. Several sections throughout the map-area contained a thin (1 metre) unit of varved sediments within the Kettleby Till.

None of these northern tills were found to have overridden the Oakridges Moraine. This complex interlobate moraine extends for 140 kilometres (90 miles) from Schomberg eastward to Colbo The last ice to override the western part of the Oakridges Moraine was the Ontario Lobe, during which the Halton Till was deposited on the southern flank of the moraine. The maximum extent of this advance is clearly marked by the Palgrave Moraine (White 1971). This moraine is composed mainly of Halton Till and was developed on the flank of the larger Oakridges Moraine from which it can be readily distinguished.

No direct evidence was found to indicate the age relation between northern and southern tills. However, the relationship suggested by White (1971, p.217) that the Halton Till is slightly older than the Kettleby Till appears to be correct.

During the initial retreat of the ice, both outwash sand, pebbly sand, and minor gravel, and ice-contact sand and gravel were deposited. The main loci of outwash deposition were in the upper parts of the rivers flowing eastward off the Escarpment. Also, large areas in the Oakridges Moraine have a glaciofluvial origin. As noted above, sand is the predominant outwash deposit with lesser amounts of gravel and pebbly sand. Similarly, most of the ice-contact stratified drift is sand, although there is a greater proportion of gravel in this type of deposit. Further, ice-contact gravel appears to be more localized rather than distributed over large areas.

While the Newmarket ice retreated, melt water was ponded between the ice front and the Oakridges Moraine. Silt and clayey silt was deposited in these Early Schomberg Ponds in massive, laminated, and varved sequences. A maximum of 90 varve couplets have been counted. The sediments were overriden by the ice that deposited the first phase of the Kettleby Till. There followed a short lacustrine interval (a maximum of 25 varves have been counted) and a second advance of the ice that deposited the second phase of the Kettleby Till. This was the last advance of the Georgian Bay-Lake Simcoe Lobe to the Oakridges Moraine.

As the Kettleby ice retreated Late Schomberg lacustrine sediments were deposited and for the first time molluscan shells appear in the sediments. With continued retreat of the ice, lower outlet channels became open and the lake level was lowered to that of glacial Lake Algonquin, at 750 to 770 feet above sea level (228 to 232 metres). A well developed strandline was formed at this level. Whether the water was lowered continuously or in stages is not known, no strandlines were found above 750 feet above sea level (228 metres).

MINERAL RESOURCES: Sand and gravel are the principal mineral resources in the map-area. The exposed bedrock has not been exploited as a building material in this area although it is used in brick-making in the Toronto region. Clearly the most important producing deposits are in the Oakridges Moraine. In 1970, the reported production from the two main townships which straddle the moraine, Uxbridge and Whitchurch, was just over 5 million tons. In

contrast, the combined reported production in the 12 other townships, wholly or partly within the map-area, was 0.8 million tons.

The producing deposits in the Oakridges Moraine are both outwash and ice-contact stratified drift, and most of the production is from deposits buried under the Halton Till. Further, although there is an enormous amount of granular material, most of it is silty sand and only a small proportion is crushable material. Also the gravel deposits have a localized and irregular distribution rather than being widespread sheetlike bodies. This implies that considerable systematic exploration must be done for coarse granular deposits and that the reserves of such material are not as great as might be expected in a landform of this type and proportion.

The following comments can be made concerning reserves in the parts of the townships within the map-area. Sufficient reserves for local needs only were found in Essa, Georgina, East Gwillimbury, North Gwillimbury, West Gwillimbury, Scott, Tecumseth, and Tosorontio Townships. Both Adjala and Brock Townships have sufficient gravel to support small commercial operations. Only Reach, Uxbridge, and Whitchurch Townships have sand and gravel supplies to sustain several large commercial operations.

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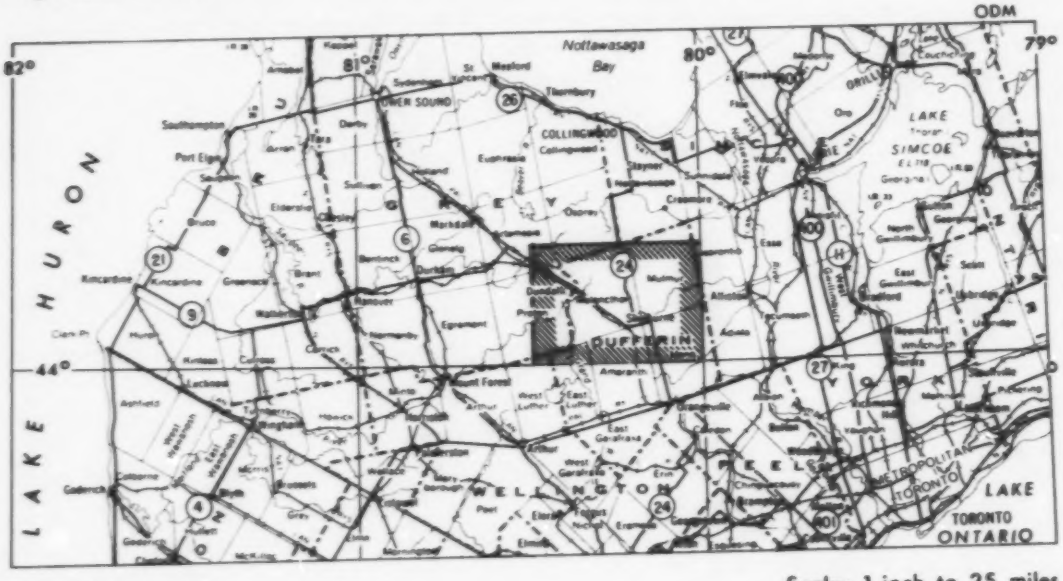
1971: Pleistocene Geology of the Bolton Area, southern Ontario; Ontario Dept. Mines and Northern Affairs, OFR 5067, 249p. Accompanied by 2 maps.

No.32 QUATERNARY GEOLOGY, ORANGEVILLE AREA WEST HALF AND PALMERSTON AREA EAST HALF SOUTHERN ONTARIO

by

W.R. Cowan[1]

LOCATION: The Orangeville map-area (40P/16) is located between Latitude 44°00' and 44°15'N, and Longitude 80°00' and 80°30'W. The Palmerston map-area (40P/15) is bounded by the same Latitudes but extends westerly to Longitude 81°00'W.



LOCATION MAP

Scale: 1 inch to 25 miles

Mapping of the western half of the Orangeville area was completed in 1972 as was most of the eastern half of the Palmerston area. Reconnaissance work was carried out over the remainder of the Palmerston area.

GENERAL GEOLOGY: Dolostone of the Middle Silurian Guelph Formation underlies the western half of the Orangeville area. Numerous outcrops occur along the Grand River, which partially occupies an incised bedrock channel. The eastern half of the Palmerston area is mainly underlain by shale, dolostone, and

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gypsum of the Upper Silurian Salina Formation; no outcrops of these rocks were observed. The contact between these two rock units trends north-south about 1 mile east of Arthur from where it swings northwesterly to leave the area about 3 miles west of Conn.

Till is the principal surficial material occurring in the area mapped; all till observed was deposited during the Late Wisconsinan Substage. The oldest till found during mapping was the Catfish Creek Till. This occurs along the banks of Grand River, along the banks of the Conestogo River between Arthur and Drayton, and along the Saugeen River near Mount Forest. Isolated outcrops occur in ditch or stream cuts elsewhere within the area. The till is a sandy silt till in this area and fabrics indicate a source area to the north and northeast.

The next oldest till was found only in river cuts between Arthur and Drayton and perhaps near Mount Forest; the most easterly exposure noted was about 1/2 mile east of Arthur. This till varies from a silt to clay till and in many places is waterlaid. In the latter condition it varies from clay with sparse pebbles to silt till containing considerable free silt. Striations on an enclosed cobble at one site ranged from 310 to 330 degrees. This till is apparently till 'B' described by Karrow (1971) to the south.

A silt to clayey silt till overlies the Catfish Creek Till along the Grand River valley and the above till in the Arthur-Drayton area. This till comprises the surface till over the west half of the Orangeville map-area and about the easternmost quarter of the Palmerston map-area. This till flanks the western side of the Orangeville Moraine and correlates with the 'northern' till of the Guelph area (Karrow 1968) and till 'C' of the Conestogo area (Karrow 1971). Fabrics obtained from this till are highly variable, however the till is believed to have been laid down from the northwest by the Georgian Bay lobe.

Near Drayton a small area is underlain by clay till stratigraphically younger than the above till. This till does not appear to be important in the Palmerston area and is not present in the Orangeville area. It apparently represents a minor glacial event to the south where Karrow (1971) mapped it as till 'D' over a much larger area. Within the present area this till is closely related to glaciolacustrine sediments.

The youngest till mapped to date is a silt to sandy silt till (till 'N' of Karrow 1971) which appears to be the surface till throughout the Palmerston area west of a line drawn approximately between Moorefield and Mount Forest although the till is present locally east of this. The outer margin of this till has not been accurately defined to date because of its similarity to phases of the next older till. From reconnaissance to the north it appears that this till is similar to that of the Singhampton and Gibraltar Moraines. Though speculative, this suggests that these moraines are recessional features in this area and, if correlation of moraines to the east is correct, it permits tentative correlation of this till with the lower northern till of the Bolton area (White and Karrow 1968) and with the Newmarket Till (Gwyn, this volume) of the Alliston area.

Outwash sands and gravels occur along the Grand River particularly south of Grand Valley, and to a lesser extent along the Conestogo River and lesser meltwater channels. Considerable quantities of outwash gravel are present in sheet deposits south and west of Mount Forest. Ice-contact stratified drift occurs in the Orangeville Moraine near Belwood, as a veneer over till north of Grand Valley, and in the Mount View Esker in the Orangeville (west half) area. Much of the Orangeville Moraine consists of glaciolacustrine sediments suggesting the presence of a large interlobal lake. This probably occurred at a time when the Ontario and Georgian Bay lobes were confluent a few miles south of Belwood prohibiting southerly drainage of meltwaters flowing into the interlobate area. In the eastern half of the Palmerston sheet ice-contact stratified drift occurs in the Riverstown Esker, the Mount View Esker, an extension of the Keldon Esker from the Dundalk area to the north, and in large surface or buried kame deposits near Mount Forest.

Shallow glaciolacustrine deposits occupy small basins throughout the area. Extensive bog deposits occur in the Luther Marsh area; lesser bogs occur throughout the area.

ECONOMIC GEOLOGY: No rock quarrying is presently taking place within the area mapped in 1972. Subsurface Ordovician rocks provided 59.8 M Mcf of natural gas during 1971 from the Arthur Gas Field.

The principal commercial extraction of sand and gravel taking place is from outwash deposits at Grand Valley, near Mount Forest, and from a small outwash terrace near Rothsay. The outwash in the Mount Forest area and between Grand Valley and Belwood on the Grand River comprise the best commercial resources within the area. Material for local use is available in limited quantities from the various kame and esker deposits.

For the parts of the townships lying within the area mapped the following comments on granular resources may be made: Amaranth Township, sufficient reserves for local needs and some commercial extraction from the Grand Valley area; East Garafraxa Township, insufficient reserves for local needs (one outwash terrace deposit 2 miles northeast of Belwood has not been opened up and warrants exploration); West Garafraxa Township, reserves sufficient for local needs and some commercial operations for a short period; East Luther Township, insufficient resources for future local needs; West Luther Township, sufficient resources for local needs only; Peel Township, insufficient resources for future local needs; Maryborough Township, insufficient resources for future local needs; Arthur Township, sufficient reserves for local needs and some commercial extraction (an area west of Mount Forest encompassing parts of four townships is capable of sustaining considerable commercial extraction). Amaranth Peat Products extracts a limited amount of peat and muck for agricultural purposes from bog deposits near Campania.

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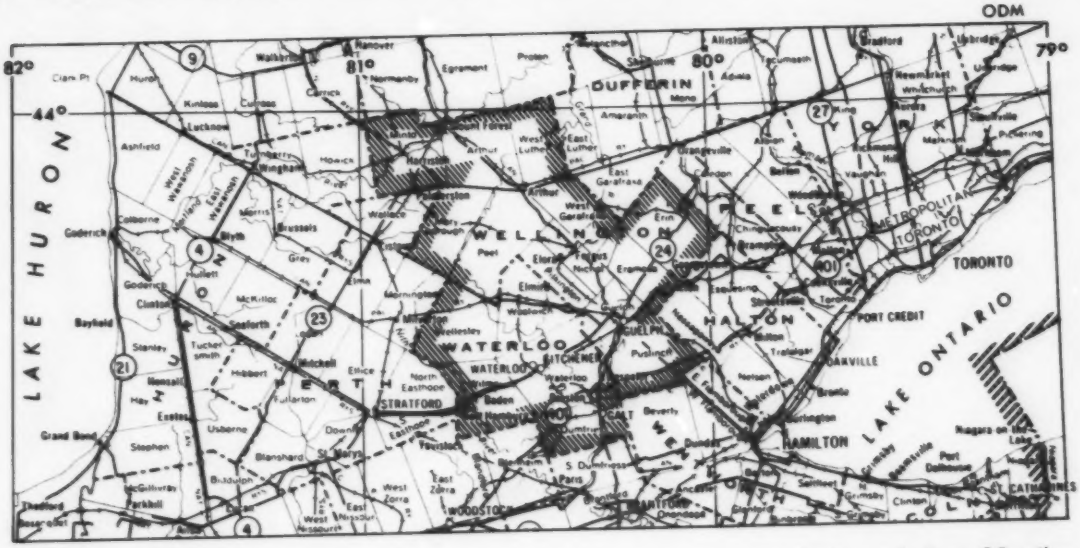
No.33 SAND AND GRAVEL DEPOSITS OF WATERLOO AND WELLINGTON COUNTIES[1]

by

A.G. McClellan and C.R. Bryant[2]

During the summer of 1972, a detailed study was made of sand and gravel deposits in Waterloo and Wellington Counties. All pertinent information such as Pleistocene mapping, soil surveys, water well logs, and company question-



LOCATION MAP

Scale: 1 inch to 25 miles

naires, were collected and analyzed. Field and laboratory analyses were done on all deposits and deposits are being codified on the basis of quality and quantity in so far as information permits.

An economic study of sand and gravel resource utilization in the area is being carried out.

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[1]Description by D.F. Hewitt, Chief, Industrial Minerals Section, Geological Branch, Ontario Division of Mines, Parliament Buildings, Toronto.

[2]Department of Geography, University of Waterloo, Waterloo.

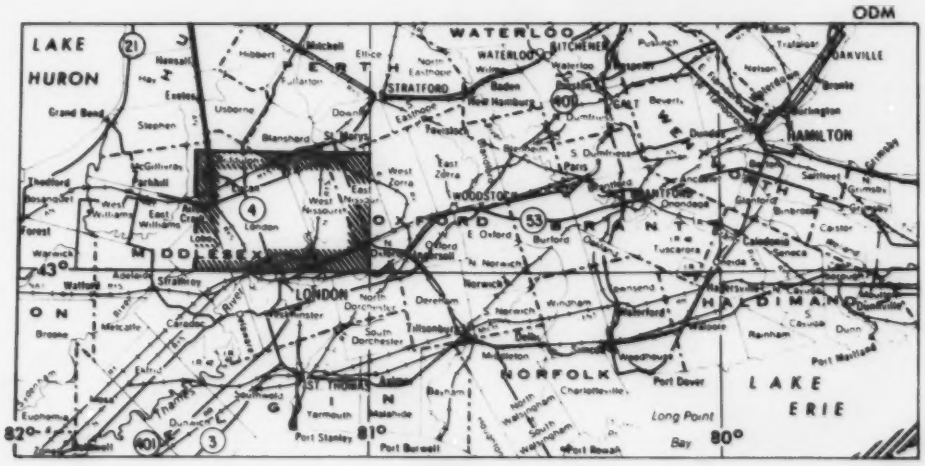
No.34 QUATERNARY GEOLOGY, LUCAN AREA

SOUTHERN ONTARIO

by

U.J. Vagners[1]

LOCATION: The area mapped is bounded by Latitude 43°00' to 43°15'N and by Longitude 81°00' to 81°30'W and represents the Lucan map sheet (NTS 40P3). The northern part of the City of London is located near the centre of the



LOCATION MAP Scale: 1 inch to 25 miles

south margin of the map-area and the Village of Lucan is situated in the northwest part of the area. Mapping was initiated in the summer of 1971 and completed during the 1972 field season.

GENERAL GEOLOGY: Limestone of Middle Devonian age is the bedrock in the area (Sandford 1969). It is found exposed along the North Thames River and in quarries in Blanshard Township. Bedrock topography is illustrated on a map by Karrow et al. (1965). From information contained on Karrow's map it may be determined that in most of the map-area the bedrock is mantled by a layer of Quaternary sediments generally 100 to 200 feet in thickness. In the following locations drift thickness exceeds 200 feet: (1) Lakeside; (2) Arva; (3) Birr; (4) Elginfield; (5) Ilderton; (6) Coldstream.

In addition to the bedrock exposures, there are some areas where the

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thickness of the Quaternary sediment cover is less than 100 feet. They are: (1) Lind Station-Granthurst area. This is the area where the Paleozoic bedrock is exposed; (2) Broughdale-Thorndale-Thamesford area. In this area there are localities (Fanshawe-Wyton Station) with a drift thickness of less than 50 feet; (3) Ilderton.

The Quaternary sediments in the area may be subdivided into Pleistocene and Recent. Deposits related to the Pleistocene Epoch include tills; glacial nonstratified sediments; and stratified sediments (gravel, sand, silt, and clay) resulting from the action of glacial meltwater. Till is the most widespread sediment in the area. Generally the exposed tills east of the Lucan Moraine (Chapman and Putnam 1966) are coarser in texture, being a sandy silt or a silty sand till, than the tills in the Lucan and Seaforth Moraines and their related ground moraines, which are composed of a clayey silt till. The coarser till may be correlated with tills 2a and 2b of Dreimanis (1964), unit 1 of Dreimanis (1970), tills 1s and 1t of Karrow (1971), and units 2 and 5 of Cowan (1971).

Stratified sediments deposited in contact with ice (ice contact stratified drift) are abundant in the area with major deposits in the following areas: (1) Cobble Hill to southeast corner of the map-area; (2) Lakeside; (3) Granthurst; and (4) Cherry Grove. Although these deposits consist predominantly of sand and gravel they also contain varying amounts of clay, silt, cobbles, and till.

Some stratified sand and gravel outwash deposits related to glacial meltwater are found along the eastern margins of the Seaforth, Lucan, and Mitchell Moraines and along Medway, North and Middle Thames Rivers, and Waubuno Creek.

Glaciolacustrine gravel and sand (stratified sediments deposited in glacial Lakes Maumee) are found near Coldstream, in the London-Thorndale area, and in the Thamesford area. Glaciolacustrine silts and clays related to local pondings, or larger glacial lakes, are found throughout the area. Most of these deposits are thin and discontinuous with some larger ones occurring near Elginfield, Denfield, and in the Coldstream-Ilderton-London area.

During the Recent Epoch alluvium has been deposited along the major rivers and streams; and organic material accumulations have produced peat in poorly drained localities. Major peat areas occur in the southeastern corner of the map-area near McWilliams.

ECONOMIC GEOLOGY: The Paleozoic limestone bedrock is used in the manufacture of cement by St. Marys Cement Company Limited in Blanchard Township (Hewitt 1964, p.65-66). Clay drain tile is manufactured by Rydall Brick and Tile Limited from glaciolacustrine clay at Elginfield (Guillet 1967, p.186-187). The major sand and gravel operations have been described previously by Hewitt and Karrow (1963) and Hewitt and Cowan (1969). The main sand and gravel producing areas are: (1) London-Thorndale area; (2) Area south and west of Thamesford; (3) Area northeast of Coldstream; (4) A small area in the northwest corner of London Township; and (5) Valley of Fish Creek,

northeast of Prospect Hill.

The London-Thorndale area is considered important as a future reserve for sand and gravel.

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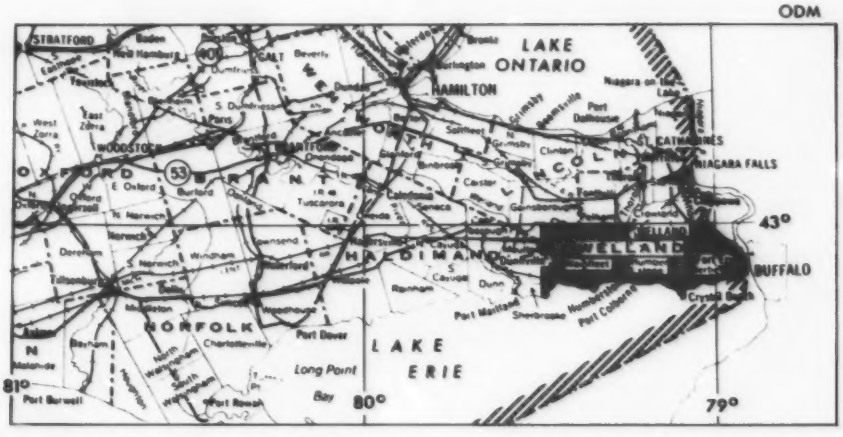
No.35 QUATERNARY GEOLOGY OF THE WELLAND AREA

by

B.H. Feenstra[1]

LOCATION: The Welland area extends from Latitude 43°00'N to Lake Erie and from the Niagara River to Longitude 79°30'W. The City of Welland is more or less north-centrally located.

The surficial geological mapping at a scale of 1:50,000 has been completed.



LOCATION MAP Scale: 1 inch to 25 miles

GENERAL GEOLOGY: Numerous Paleozoic bedrock exposures consisting of Silurian Bertie Formation dolostones and Devonian Bois Blanc Formation cherty limestone occur in an east-west belt across the southern part of the map-area from the Onondaga Escarpment (multiple scarp) south to Lake Erie.

The bedrock surface has been modified by glacial erosion (streamline forms). Striations and small-scale directional features, formed by ice most likely during the Port Huron Stade, indicate consistently throughout the area, ice movement from the northeast. Re-entrants in the Onondaga Escarpment are parallel to that direction.

Excavations for the relocation of the Welland Canal reveal the following generalized Pleistocene lithostratigraphic sequence from top to bottom: an

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upper glaciolacustrine clay-silt unit, one and possibly two (at Welland) upper clay-clayey silt tills, a lower glaciolacustrine clay-silt unit, and a lower gravelly sand to silty till unit resting on bedrock. A similar sequence is present in the Fort Erie area. It is thought that the tills were deposited during the Late Wisconsin Port Huron Stade, the upper fine-grained till(s) being a correlative of the Halton Till, the lower coarser grained till being possibly a correlative of the Wentworth Till (pending analytical results). Till outcrops are scarce in the map-area and occur mainly as slender ridges (perpendicular to ice movement), consisting generally of the upper fine-grained till, in the glacial lake plain (Welland map-area). They are as follows from northeast to southwest: 1) the Fort Erie Moraine and possible correlative in the form of two 1- to 1-1/2-mile long parallel ridges east of Welland; 2) the Crystal Beach Moraine; 3) a 1-1/2-mile long ridge north of Morgans Point; and 4) a slightly shorter ridge at Mohawk Point (part of the Port Maitland Moraine?).

The map-area is covered most extensively by glaciolacustrine clay and silt (possibly Lakes Warren to pre-Dana in age). Air photos show a washboard-type pattern in this area trending northwest-southeast-south, oblique to ice movements, with a relief of 1 to 2 feet and extending southward to the Onondaga Escarpment. A few sections present show deformation of the glacio-lacustrine clay and silt (grounded crevassed ice?). Areas of shallow water glaciolacustrine sand and silt as well as numerous short beach and(or) off-shore bars consisting of gravelly sand and gravel are located on the till ridges-moraines and on bedrock rises in the Ridgeway-Crystal Beach and Bethel areas at elevations ranging from 600 to 650 feet above mean sea level. The beach segments , at an approximate elevation of 640 feet, belong to Lake Dana.

A field of fossil parabolic and longitudinal dunes consisting of fine sand and indicating prevailing westerly winds is present west of Wainfleet. These dunes are a maximum of 20 feet high and rest on shallow-water glacio-lacustrine-deltaic(?) sediments (surface elevation 581 to 585 feet).

During the Holocene peat accumulated in depressions in the glacial lake plain in front of the Onondaga Escarpment (re-entrants), the largest one being the Welland Peat Bog. A narrow strip of longitudinal sand dunes, best developed in the Point Abino area, extends behind the modern Lake Erie beach from Fort Erie to just west of Grabell Point. The formation and growth of these dunes created ponding by closing bedrock-controlled depressions. These ponds are now filled with peat, organic-rich silt and clay, and dune sand, especially at Port Colborne and in the Crystal Beach-Shisler Point area.

ECONOMIC GEOLOGY: The Bertie and Bois Blanc Formations are presently being quarried primarily for aggregate southeast of Stevensville and in the Port Colborne area. Peat is extracted from the Welland Peat Bog. The total reported mineral production in 1970 amounted to $2,426,850 (Statistical files of the Ontario Division of Mines).

No.36 GRAVEL INVENTORY

SOUTHERN ONTARIO

by

G.J. Burwasser[1]

A survey of granular resources in part of southern Ontario was made to update information about sand and gravel reserves in the Province. The area covered during the 1972 field season is indicated in the accompanying Figure. Field work consisted of visiting existing pits to describe materials and related surficial geology in order to arrive at an estimate of remaining reserves. The Ministry of Transportation and Communication supplied a large quantity of information gathered by the Materials and Testing Branch, which was useful for establishing proven reserve levels. The granular resource rating system published in Hewitt and Yundt (1971) was employed to place each township investigated into one of four categories ranging from very limited reserves to very large reserves. In applying the rating system to a township, consideration was given to quantity and quality of reserves, requirements of the local market, capability to supply distant markets, and possible demand on existing resources during the next five years.

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[1]Geologist, Industrial Minerals Section, Geological Branch, Ontario Division of Mines, Parliament Buildings, Toronto.

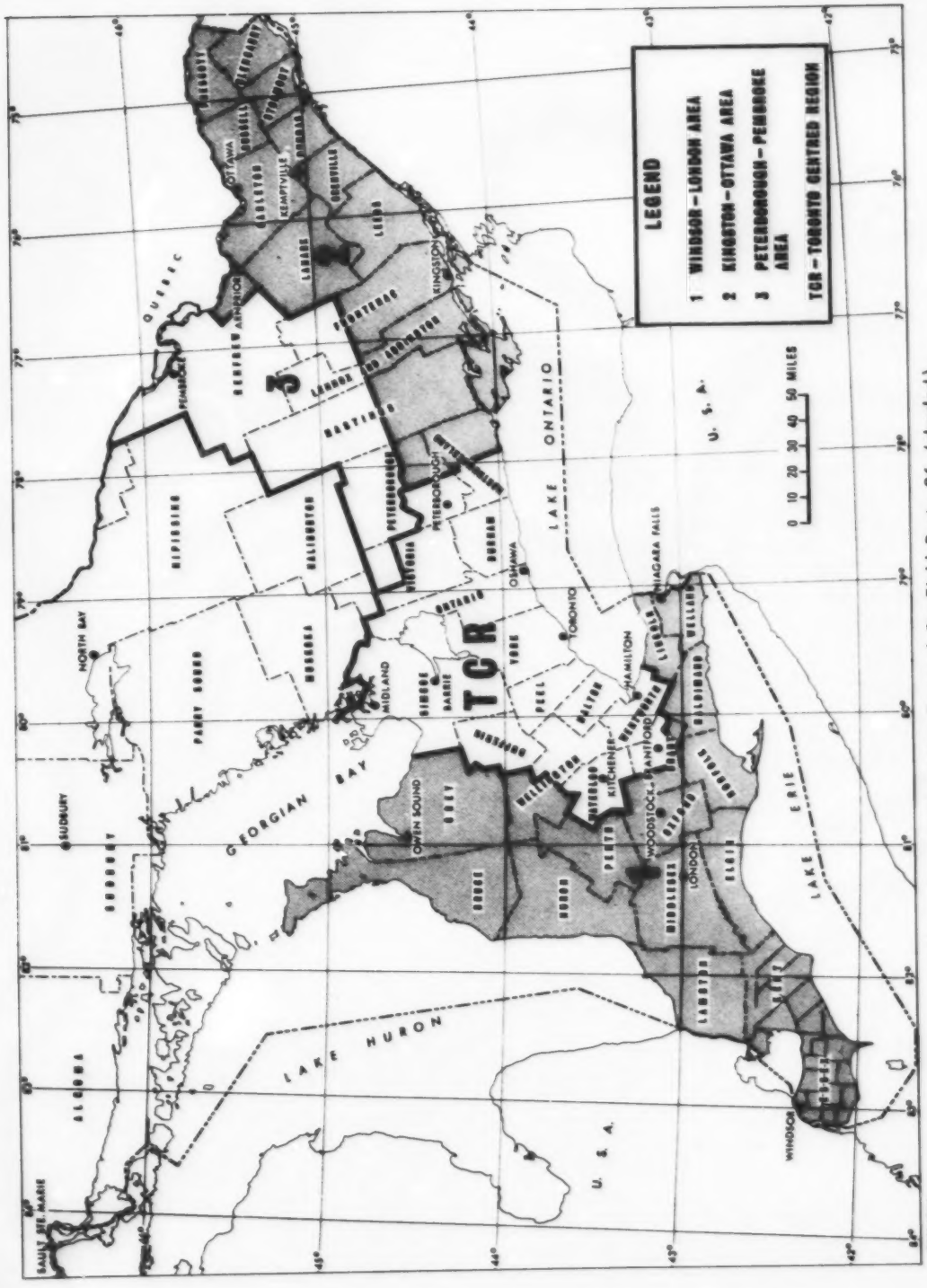

Figure 3 – Areal Extent Covered By Field Party 36 (shaded)

No.37 INDUSTRIAL MINERAL STUDIES

by

M.A. Vos[1]

In the Annual Statistical Reports on the Mineral Production of Ontario production figures are grouped under four headings. They are metals, non-metals, fuels, and structural materials. Non-metals and structural materials, together known as industrial minerals, represented 15.5 percent of the total estimated production value in 1971. Structural materials contributed the major share or 13 percent. Accordingly the resource rocks concerned have received most of the attention in previous summers' field-work.

In 1972, industrial mineral studies by the author included examination of peat moss operations, asbestos, talc, nepheline syenite, gypsum, and salt mines, silica, aggregate, and building stone quarries and fluorite, apatite, mica, and kyanite deposits.

PEAT MOSS: Two peat moss operations are active in the Welland bog, 2 to 3 miles northwest of Port Colborne. The operating companies are Atkins and Durbrow Limited and the Shamrock Peat Farm. Peat is reported to reach a thickness of 5-1/2 feet in the area. Preparation of sections of the bog includes digging of drainage ditches and stripping of surface growth, tree stumps, and roots from the upper layer of peat. After a suitable period of dry weather the upper layer of peat, to a depth of approximately 1 inch, is sucked off in a large vacuum cleaner-type operation; the material is then ready to be packed and shipped in plastic bags. It is sold as a soil conditioner to gardeners in Canada and the United States. Suction of dry peat can be repeated several times over the same area in the course of one summer.

NEPHELINE SYENITE: Nepheline syenite is mined near Nephton, 30 miles northeast of Peterborough.

The nepheline syenite occurs as a predominantly concordant body in a synclinal trough of metasediments and was subject to a complex metamorphic history.

The following information on the operations of one company, Indusmin Limited, was obtained from officials at the mine. Several parts of the nepheline syenite body are mined simultaneously to meet diversified customers' demands. Not only is it important to have a high alkali content but the proportion of sodium to potassium is often specified. Batching of

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raw materials, amongst others, allows for preparation of a total of 19 products. Parts of the orebody had to be redrilled to establish the exact chemical composition of the ore.

The bulk of nepheline syenite is used in glass manufacture where it lowers the melting point of the batch. Other uses are in whiteware, glass fibre, porcelain enamel, and paint.

TALC: Mining operations of Canada Talc Industries Limited at Madoc are described by Hewitt (1972).

The orebodies occur as tabular hydrothermal replacement bodies in Grenville crystalline dolomite. The Henderson body appears to lie near the crest and on the south limb of an anticlinal structure.

Development at the third or 600-foot level of the Henderson Mine has been expanded. About 300 feet of drift and three draw points have been added. Mr. McDonald is mine superintendent.

Mining is done by a method of natural caving over the draw points. Occasional blasting is necessary to clear the entrance to draw points. Hand sorting is applied at the muck pile whenever the highest grade white foliated talc is soiled by steatite, which occurs next to it on one side of the orebody.

GYPSUM: Gypsum is mined by two companies in Ontario; they are Canadian Gypsum Company Limited at Hagersville and Domtar Construction Materials Limited at Caledonia. Both companies operate gypsum beds in the Silurian Salina Formation. The operations are described by Guillet (1964).

In Hagersville a 3- to 4-foot thick gypsum bed is found at a depth of 60 to 100 feet in the mining area. It is mined by room and pillar method. The rooms have a low back. Scrapers previously used for removal of broken ore from the mining face have been replaced by Joy loaders now loading electrically driven, rubber tired, 6-wheel, 6-ton, shuttle cars. These cars are 36 inches high. They carry ore to the 7-foot high main drift where the load is dumped from a ramp into a series of 2-ton rail cars.

In Caledonia, Domtar Construction Materials Limited operates No. 2 Mine on a 2-shift basis employing 25 laborers. The 8-1/4-foot gypsum bed found at a depth of 75 feet is mined in 15 to 18 headings simultaneously.

Broken rock is transported by 6-ton scoop tram or 5-ton transloader to a conveyor belt that carries ore to the underground crusher. After crushing, a conveyor belt takes ore to surface along the inclined shaft. Ore then is trucked to the plant.

SALT: Salt beds in the Silurian Salina Formation are of sufficient thickness for economic exploitation in the Windsor, Sarnia, and Goderich areas. Brine extraction for use in the company owned chemical plant at Amherstburg, in the Windsor area, is carried out by Allied Chemical of Canada Limited. Two new wells, close to 1,200 feet deep, have been added to the existing series of 19 wells.

Mining of rock salt by Canadian Rock Salt Company Limited at the Ojibway Mine, 2 miles southwest of Windsor city limits, continues. A 24- to 27-foot thick bed belonging to the 'F' unit of the Salina Formation is mined at a depth of 948 to 975 feet below the surface. Present operations progress eastward in the central area of the mine. The northeastern section is temporarily avoided because of weak roof conditions. Undulations in the contact with overlying shale in this area cause added problems of water leakage. Presently a 6-foot barrier of salt is maintained between the roof and the shale contact following such undulations. Rooms are an average of 18 feet high. Square, 40- by 40-foot pillars are maintained.

In the brining field of Canadian Salt Company at Windsor, a total of 18 wells is maintained. Those not in production are pressurized to prevent caving. A depleted brine field including four wells has recently been tested for purposes of liquified gas storage. High pressure tests were completed successfully and the field is expected to be used accordingly in the near future.

Mining of rock salt and brining are carried out by Domtar Chemicals Limited, Sifto Salt Division in the Goderich area.

A sortex machine has been installed to produce colour-sorted rock salt for use in water softening.

The evaporated salt plant will be expanded with a packeting section. Two packeting machines will be operating to replace packeting of salt, sugar, and pepper in small quantities for use in hotels, airplanes, etc., now performed on contract for Sifto in the U.S.A. Two new wells are scheduled to be drilled next year in the brining field.

SILICA: The main producers of silica in Ontario are Indusmin Limited with the Badgeley Island Quarry near Killarney and The International Nickel Company of Canada Limited with a quarry near Whitefish Falls, Ontario. They both produce from Lorrain quartzites.

Products from the Badgeley Island Quarry are either shipped directly as lump silica or they are transferred to Midland for further processing. Lump silica is used in ferrosilicon and silicon carbide production whereas the Midland plant produces silica for glass manufacture and silica flour.

Three grades of silica are mined in the quarry and batched to maintain a uniform quarry product. A trap rock in the quarry may be mined separately in the future for aggregate production.

Silica produced in the Lawson Quarry near Whitefish Falls is used entirely as a flux in the ore-smelting process in Copper Cliff. Drilling is now done with a Bucyrus-Erie diesel-electric drill and the annual drill program is completed in two months. Holes of 9-inch diameter are drilled to a depth of 70 feet in a 28- by 30-foot pattern.

Another silica quarry in the Sudbury area is operated by Carman Construction Limited. It is located on the southern shore of the western

part of Lake Panache. Ore is shipped to a crusher on the north shore by barge. Crushed quartz is sold as concrete facing.

The same company also operates a quartzite quarry near Alban, about 35 miles southeast of Sudbury. A quarry face of approximately 100 feet wide and 75 feet high can be seen in the hill side.

AGGREGATES: Quarries producing stone for landscape aggregate, concrete facing, and terrazzo chips were examined in different parts of the province.

Erana Mines Limited, located 2-1/2 miles northeast of River Valley, Nipissing District, operates several quarries. Landscape aggregates are shipped by truck as far away as Detroit and by rail to Chicago and Winnipeg. Concrete facing with a plastic base will be shipped as a ready made plaster in 30- and 50-pound pails in the future. The plaster will be available in any desired colour and is appliable to wood, concrete, brick, or artificial siding. It serves as water proofing after drying, which is complete within two hours of application.

Quartzose gneisses, coloured red or green, or sparkling due to their mica content, occur in adjacent beds along the north shore of Reynolds Lake, 6 to 7 miles east of Diver on the Ontario Northland Railway, Nipissing District. Three companies operate quarries in this area. They are McLaren Bay Mica Stone Quarries, Ontario Natural Products Limited, and Sparkoroc Industries Limited.

Terrazzo chips are produced in several marble quarries located in the Madoc area. Two companies involved are Grenville Aggregate Specialties Limited and Stoklosar Marble Quarries Limited.

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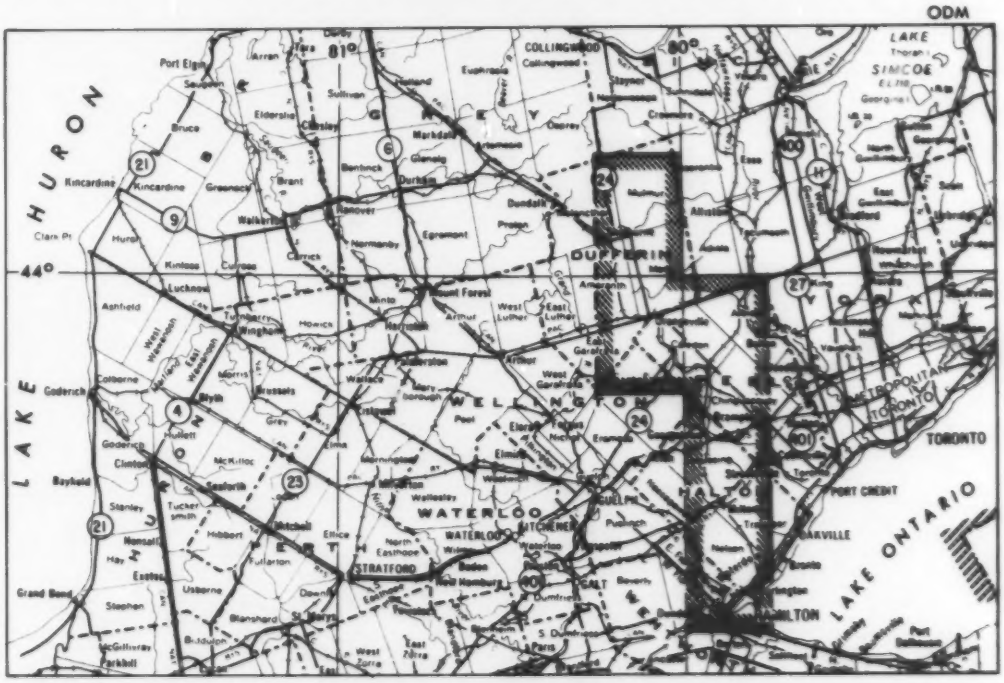
No.38 PALEOZOIC GEOLOGY OF THE NIAGARA ESCARPMENT[1]

by

B.A. Liberty[2] and I.J. Bond[3]

During the summer of 1972, Paleozoic geological mapping was completed for the Hamilton West, Brampton West, Bolton West, Orangeville East, and Dundalk East, National Topographic Sheets. The Niagara Escarpment was mapped



LOCATION MAP

Scale: 1 inch to 25 miles

from Hamilton north to Honeywood as part of a program of mapping and defining the face of the Niagara Escarpment.

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[1]Description by D.F. Hewitt, Chief, Industrial Minerals Section, Geological Branch, Ontario Division of Mines, Parliament Buildings, Toronto.

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